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Assessing school environments

A temporal, syntactical, socio-spatial approach to Basil Bernstein's framework of classification and framing

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ABSTRACT

Existing scholarly work in the field of space syntax research has highlighted the potentials of incorporating Bernstein's (1973) dimensions of classification and framing for investigating the interplay between physical spaces and pedagogical practices. They have translated Bernsteinian concepts in various syntactical terms in order to identify whether a school configuration can create the potentials for certain educational codes and then result in a certain school's community. However, they often incorporate different theoretical reasoning and thus different syntactical measures. Simultaneously, the translation of the Bernsteinian concepts to space is rendered as rather stable in time and by often incorporating one syntactical metric per dimension.

Therefore, this study aims at providing a more holistic methodological approach to the translation of Bernsteinian concepts in syntactical terms. Simultaneously having in mind, the complexity of school environments, this study aims at offering a more temporal approach to this investigation. Hence, to achieve the above objectives, this study jointly considers: Bernstein's account, existing research studies that have attempted to translate his theoretical account into space and lastly assemblage theory (Deleuze & Gattarin, 1987) that underscores the necessity for a more relational consideration of space. Thus, the main research question of this paper is to what extent school environment can be approached as an assemblage of various socio-educational codes that are constantly formed producing forms of solidarity? as well as to what extent school's educational code can be shifted by means of social agency and rules application?

Ten open-air secondary schools built in Cyprus after 2000 serve as case studies. The methodology implemented for this study combines a consistent analysis of syntactical, functional, and morphological properties for all ten schools of the sample with behavioural data

that are retrieved by onsite observation of space usage from two schools of the sample. The contribution of this study is twofold: Firstly, it builds on existing scholarly work in the field of space syntax and provides a holistic and dynamic framework for the syntactical translation of the Bernstein's concepts to space. Secondly, conceptually this paper highlights the role of agency

KEYWORDS

School Buildings, Bernstein, Classification, Framing, Assemblage

1 INTRODUCTION

School buildings have always been examined in relation to teaching and learning practices in multiple ways. This is because schools have always had "an important function in society, namely, educating the future generations" (Williams et al., 2014, p.83), fostering cognitive development, conveying information and knowledge about subject matters of the curriculum as well as conveying the joy and excitement of learning (Rivlin and Weinstein, 1984).

Thus, the school building as a pedagogical device is approached by existing studies so as to decode the relationship between school building and pedagogical practices. For instance, scholars have examined the effect of the school building on pedagogy as well as the impact of various spatial conditions (such as the size of the school, the syntactical centrality of functions) on the school's ability to provide flexible education (Kishimoto and Taguchi, 2014). Additionally, few studies in the discourse of space syntax research had suggested that by bringing Bernstein's (1973) sociology of education to bear, the relationship of the school building with educational practices can be decoded (Sailer, 2015; Sailer, 2018; Peatross and Peponis, 1995; Tzortzi, 2011; Vieira and Kruger, 2015; Capille, 2016; Pradinuk, 1986; Zamani and Peponis, 2010; Tzortzi, 2007). Specifically, they have suggested that by finding the spatial analogous of Bernstein's educational code, the strength of the pedagogical framework can be decoded and thus the form of school community that is promoted by the school's layout can be identified.

However, despite the valid contribution of existing scholarly work, there is currently no framework that helps to examine various dimensions of classification and framing at once and thus to address the educational code that derives from the school layout holistically. Additionally, in the collection of existing studies, the educational code that is proposed is rather stable in time and has been no reference to the power of the agency in changing or even shifting the educational code provided by the layout. However, this is particularly important, since in recent years relational theories such as Assemblage Theory (Deleuze and Guattari, 1987; DeLanda, 2006) underscore the necessity of approaching space in 'terms of process, identity formation, [and] becoming' (Dovey and Fisher, 2014, p.49). In other words, they highlight the importance of embracing social agency in order to fully grasp the complex nature of school spaces as well as the embeddedness of various actors and social agency in the school environment. In that respect, by considering only spatial agency (Hillier, 2012) or the

way the spatial configuration can have lawful effects on the space usage pattern is not enough in order to fully address the complex nature of school environments.

Thus, the main aim of this paper is to explore the extent to which the school environment can be approached as an assemblage of various socio-educational codes that are constantly formed and create forms of solidarity. Lastly, it also aims to reveal the extent to which a school's educational code can be shifted by means of social agency and rules application.

In detail, the paper is structured as follows: Chapter 2 briefly discusses Bernstein's theoretical account on educational codes, existing studies in the field of space syntax that have translated those concepts to space and assemblage theory as the theoretical ground for achieving a more relational consideration of space. Chapter 3 proposes a methodological framework for the investigation of educational codes in schools and discusses the research case studies. Chapter 4 presents on research findings, while chapter 5 draws on this study's conclusions, contribution, and limitations.

2 BASICL BERNSTEIN'S EDUCATIONAL CODES, SYNTACTICAL TRANSLATION & ASSEMBLAGE THINKING

2.1 Basil Bernstein's educational code and school space

Basil Bernstein, by elaborating on formally constructed knowledge, has examined "how a society selects, classifies, distributes, transmits and evaluates . . . educational knowledge" (Bernstein, 1973, p.227). He argues that formally constructed educational knowledge is realised through three different systems – curriculum, pedagogy, and evaluation. Thus, he considers that the curriculum defines valid knowledge to be transmitted, while pedagogy defines the valid way of transition of knowledge. Lastly, the evaluation describes what is considered as a valid realisation of the acquired knowledge. In that sense, he has argued that the underlying principles that shape the relationship of those three aforementioned message systems (curriculum, pedagogy, and evaluation) define certain 'educational knowledge codes'.

Therefore, Bernstein has proposed two different dimensions, classification, and framing. Classification refers to the degree of boundary between contents, while framing refers to the degree of control in the transmission of educational knowledge. If the classification is strong, then the boundary between different contents of knowledge is also relatively strong. Weak classification, in contrast, depicts a more integrated curriculum, where different contents are allowed to have an influence on each other. Simultaneously, if the framing is strong, there are reduced options, while a weak framing provides a range of options in control of what is transmitted and received. Strong classification and framing produce a collection educational code, while weak classification and framing point towards

an integrated educational code that blurs the boundaries between subjects and at the same time reduces the power of the teacher over what and how it is taught.

In turn, according to Bernstein (1973), different educational codes may create opposing types of solidarity. In other words, if the framing is strong, the authority over what and how it is taught is mainly up to the teacher who determines the way and pace of teaching. At the same time, the different teachers have low interdependency between them. Therefore, this structure results in a hierarchical organisational structure by highlighting the differences between user categories. On the other hand, in an integration code school, individual users rely on each other. In fact, a weak framing 'decreases the discretion of the individual teacher and requires coordination and homogeneity in pedagogy and evaluation, thus giving authority to an institution' (Sailer, 2015, p.34:3).

The above forms of solidarity can also be seen in the light of Hillier and Hanson's correspondence and non-correspondence models. In particular, Hillier and Hanson (1984) have argued that the mechanisms of solidarity might be spatial or transpatial. Spatial solidarity can arouse via proximity and co-precence, while transpatial solidarity via kindship, affiliation or profession (Sailer and Penn, 2009). Hence, based on this distinction between spatial and transpatial relationships they have distinguished correspondence from non-correspondence models. Correspondence models are those that spatial encounters are, in fact, reinforced by transpatial solidarity. On the other hand, non-correspondence models allow transaptial solidarity to overcome spatial proximity. Thus, as argued by Sailer (2015) a correspondence model, is primarily characterised by exclusivity, local strength, and boundaries maintenance. On the other hand, a non-correpondence model thrives on openness, equality, global strength, and inclusivity. Hence, a form of solidarity can be assessed whether it instigates an overlap of spatial and transpatial groupings, thus bringing everyone in contact (non-correspondence) or is organised by separate groups maintaining their own string identities(correspondence).

2.2 Syntactical translation of Bernstein's concepts to school space

Based on the above concepts, a number of scholars in the discourse of space syntax has attempted to translate Bernstein's dimensions to space in order to discuss and evaluate the relationship between space and pedagogy.

Sailer (2018), Sailer (2015), Zamani & Peponis (2010) and Peatross and Peponis (1995) have argued that an educational building could be characterised as strongly classified when there are clearly demarcated sections promoting disciplinary differences in pedagogy (i.e., different locations for STEM and Arts and Humanities). Additionally, Sailer (2018) argues that in strongly classified schools there are differences by role (i.e between pupils and teachers etc), limited movement options and spatial separation. Lastly, Pradinuk (1986) argues that strongly classified environments have also visual insulation between contents. Hence, in order to identify these conditions, the authors have

developed varying conceptualisations and have used for the identification of classification dimension the following methods and metrics:

- segment analysis and particularly NACH value for the overall syntactical understanding of the building, A,B,C,D space type analysis to identify the degree of movement option and thus to reflect on the degree of overlap between movement and occupation in the school (Sailer, 2018);
- functional analysis (Peatros & Peponis, 1995; Sailer, 2015) in relation to syntactical measures for identifying the spatial distribution of functions. For instance, they have used axial analysis (Peatros & Peponis, 1995), VGA analysis (Sailer, 2015), isovist analysis (Zamani & Peponis, 2010) as well as covaxial integration along with the functional mapping.

In respect to the framing dimension various assumptions have been made. For instance, Peatros & Peponis (1995) have argued that strong framing is depicted when distinct teaching for different levels of study is achieved and when teachers are working separately for the production of educational materials. Sailer (2015) and Sailer (2018) have also introduced the aspects of fixed teaching styles in strongly framed schools as well as the ultimate authority of the teacher over what is taught. Sailer (2018) additionally argues that strong framing can be found when all the control lies with the head teacher. Pradinuk (1986) as well as Zamani & Peponis (2010) have translated the strong framing by considering movement patterns. In particular, they both consider a layout as strongly framed when there is a rigid and sequential circulation that separates the users. Hence, in order to identify these conditions, the authors have developed varying conceptualisations and have used the following methods and metrics:

- VGA analysis (High Visual integration) as an indication for a spatial layout that allows teaching flexibility as well as as a way to capture the visibility and openness towards corridors and intervisibility among pupils within the classroom (Sailer, 2015);
- Mean convex integration in order to identify how far it is necessary to move through sequences of spaces to arrive to all the other spaces (Pradunuk, 1986)
- Jgraph analysis in order to capture the movement paths within the layout (Zamani & Peponis, 2010);
- Mapping of the educational programme in order to identify how the organisation works and thus address the degree of framing in the institution (Peatros & Peponis, 1995).

This comparative investigation has shown that a common approach can be found between existing studies. Specifically, what is shared among the cases is the attempt to translate Bernsteinian concepts in the school's environment. They all have used spatial, functional, and organisational mapping in order to address the different dimensions, while they point out the importance of visibility and permeability when trying to conceptualise Bernstein's dimensions in space.

Therefore, it becomes clear that the different studies might be based on the same theoretical background, but they also differ in various respects. All the hypotheses or spatial conceptualisations that have been generated for both dimensions (classification and framing) are pretty diverse but can be all considered particularly valid and well justified. Additionally, the methods that have been used to address the two dimensions are particularly diverse (visibility, accessibility graphs, functional mapping, isovist analysis, segment analysis, A-B-C-D spaces) but all have a well stated hypothetical reasoning behind.

Additionally, it could be argued that despite the valid contribution of existing scholarly work, various gaps can be identified. Firstly, there is no framework now to understand the various dimensions of classification and framing at once and thus all together contributing to the formation of an educational code derived from the school layout. Also, the educational code that is proposed by all studies is rather stable in time and there has been no reference to the power of the agency in changing or even shifting the educational code. However, one may argue that 'different approaches to educational practices and school leadership [can] give rise to distinctive school cultures which in turn make differences in the use and adaption of a school building' (Daniels et al., 2019, p.44). Hence, a more dynamic and temporal understanding of a school's educational code is needed.

2.3 Relational ontology to space and assemblage thinking

Hence, this paper in order to reflect on relationality and temporality of space considers additionally assemblage theory since it can offer a solid starting point to consider the socio-spatial spectrum constantly in the process of making. In that sense, it could offer a reformed understanding of the school's unit not as a mere physical structure can help in acknowledging the role of social agency, leadership, and organisational structures in the materialisation of socio-educational codes in schools.

Assemblage thinking is a concept that goes back to the philosophers Deleuze and Guattari (1987). The term assemblage is the translation of the French word 'agencement', which refers to an arrangement or alignment. Assemblage is a mode of ordering relational and heterogeneous entities in a way to work together for a certain time to form a new whole. In that sense, assemblages are firstly productive, since they constitute aggregations of different elements linked together to form a new whole. Assemblages are secondly relational and heterogeneous and there are no pre-determined hierarchies., Thus, they constantly produce new behaviours, new territorial organisational, actors and realities (Müller, 2015). However, the properties of an assemblage are irreducible to the properties of its parts. In that sense, a part can be detached from an assemblage and be attached to another. Thirdly, assemblages are defined both by the variable role of their components and by the synthesising process in which the various components are involved. Specifically, the varying role of the components is addressed by means of their material or expressive nature, while their synthesising process is addressed through the processes of territorialisation and deterritorialisation. Territorialisation is the

process that stabilises the identity of an assemblage, while deterritorialization destabilises its identity. In that sense, the territory is a stabilised assemblage.

Few studies in the field of the built environment (Charalambous and Geddes, 2015) have highlighted the potential of incorporating assemblage theory in the examination of spatial structures. By adopting an assemblage thinking, Delanda (2006) has developed a theory of social assemblage. DeLanda argues that social assemblages can be used so as to understand and analyse complex entities such as cities. Specifically, he has claimed that cities can be approached as assemblages of both social and physical elements (i.e., people, networks, buildings, streets), the emergence of which involves various scales (not just the micro and macro scale).

In the context of school building, Dovey and Fisher (2014) have studied various primary schools in the UK in an effort to investigate the relationship of school's plans to pedagogical theories. Specifically, by using the theoretical framework that is suggested by assemblage theory, they have firstly identified various clusters of learning spaces in a series of school plans and then they have analysed them in terms of their capacity for socio-spatial interconnection and adaptation. However, despite the valid theoretical contribution of this study, methodologically it has not been clear how the concept of assemblage has influenced the way the authors have analysed and examined school buildings.

Based on this particular theoretical basis, other studies by Psathiti (2018) and Psathiti (2019) by jointly examining spatial configuration and space usage patterns have suggested that socially inscribed rules have the power to differentiate the configurational structure and thus behavioural patterns in a school environment. In fact, research results suggest that socially inscribed rules can differentiate the relationship between indoor and outdoor space and the mutual visual areas of the school's layout as well as users' potential zones of operation.

Overall, assemblage theory can offer a solid starting point to consider the socio-spatial spectrum constantly in the process of making (Brenner, Madden, and Wachsmuth, 2011), where the built form is approached not as a mere physical system but in an interaction with the otherness, as multiple, incomplete, different, and always in the process of making (Tornaghi and Knierbein, 2015).

2.4 Educational code, syntactical aspects, and temporality

Correspondingly, by considering all the points mentioned above, this study hypothesises that the school environment could be approached as a complex socio-spatial whole where different degrees of classification and framing might be identified. Into more details, it is assumed that ongoing socio-spatial dynamics and actors' actions within a school unit are in constant association with the school spatial structure and thus might shift the educational code by creating different degrees of

classification and framing and thus different types of solidarity in the school. Methodologically, based on the review of existing literature, the dimensions of classification and framing could be addressed with multiple methods and metrics and thus it is assumed that a more holistic and complimentary approach that considers various spatial conceptualisations at once is needed.

3 DATASETS AND METHODS

3.1 Research Methodology

In order to develop the unified, flexible and adaptable framework that could identify the educational code that is suggested by the layout, a series of spatial conceptualisations has been developed by the authors based both on the existing literature and additional conceptualisations. In particular, the list of spatial conceptualisations works as a thinking device so as to render the degree of classification and framing and translate it to syntactical and other metrics. The list of the spatial conceptualisations that are used for this study is summarised below:

Classification

• **SC1:** The more movement potentials exist in a school (Peatros & Peponis, 1995), the more a school building stitches its different parts together by means of movement and thus the lower the differentiation between types of contents (weaker classification). In space syntax terms, choice metrics capture the potentiality of a space to be selected as a route when people e moving from one space to another. Thus, the higher the choice values (axial choice, axial choice R3, T1024 choice, NACH), the more the movement potentials are offered within the school and the weaker the classification and the boundary between types of contents is (i.e, classrooms, sparts, special classrooms) (Sailer, 2018; Peatros & Peponis, 1995);

• **SC2:** The denser the functions on the school's ground floor, the greater the potential mix of the various contents of knowledge and thus the lower the classification. In this respect the ground coverage index (GSI) proposed by Berghauser Pont and Haupt (2004) could be particularly useful. Specifically, GSI is a variable that captures the density of the scheme on the ground floor. Thus, it is assumed that the higher the GSI value, the denser the functions and thus the weaker the classification.

• **SC3:** The higher the separation between school floors, the stronger the separation between types of classrooms and thus the stronger the classification. The floor separation is calculated through a proposed index which is a joint measure that describes the separation between floors. Floor separation index is defined as the relative number of floors divided by the relative centrality of staircases.

• **SC4** The more segregated the sports area is in relation to the rest of the building, the stronger the classification, since it is differentiated from the spaces that accommodate other contents of knowledge. Thus, the higher the centrality of the sports area in the school, the lower the differentiation with other functions and hence the weaker the classification. In order to calculate the relative centrality of sports area along with other functions of the schools, this study uses the FIR metric proposed by Kishimoto and Taguchi (2014). The FIR in the study of Kishimoto and Taguchi (2014) has been generated by means of convex map analysis and is defined by the following expression:

Mean Integration of Specific Function / Mean Integration of all School Spaces. If the FIR value is greater than one, it points to a relatively centrally located function in the school. If the FIR value is less than one, it means that the function is located at a relatively segregated position in the school. This metric has been calculated for every functional polygon within the school and has been aggregated per unique function (i.e., classrooms, administration, etc.). Nevertheless, this study calculates the FIR metric through axial map analysis, since the convex map has a static approach to space that seems to neglect the movement and paths within it (Behbahani, Gu, and Ostwald, 2014).

Framing

• **SC1:** The more integrated the school building is, the less control exists on the events and encounters (Sailer, 2018; Sailer, 2015). In essence, the shallower the building, the easiest is to reach all other spaces. Thus, the less hierarchical is the pedagogical process, since it is more easily exposed to adjacent activities and thus the lower the framing (Axial Integration, T1024 Integration, Visual Integration, Axial Mean Depth, Visual Mean Depth);

• **SC2:** The higher the centrality of general and special classrooms (Sailer, 2015), the lower the framing, since the more centrally the classrooms are located, the less control is given to the teachers, since the pedagogical process is more exposed to the movement and encounters happening around (FIR General Classroom, FIR Special Classroom);

• **SC3:** The more visually synchronous the space is, the more the teachers 'lose their inhabitant status and become visible, synchronised and controlled' (Sailer, 2018, p.3) since different user groups are connected by means of co-presence. Thus, the higher the mean isovist perimeter in a school, the lower the framing.

• **SC4:** The lower the depth from administration, the lower the framing, since there is less separation between teachers and headteachers location from students in the school (Step Depth from Admin, Relative Centrality of Administration (FIR));

• **SC5:** The higher the centrality of the cantine, the easier is to reach it from all the other parts of the school. Cantine constitutes a destination for all school users, and thus, it centrality could satisfy accidental encounters between school users such as teachers, students, headteacher, etc. (Relative Centrality of Cantine (FIR));

In order to utilise those spatial conceptualisations in the development of a flexible framework the methodology implemented for this study. **Firstly**, it combines syntactical functional and morphological analysis of 10 school buildings in Cyprus. This comparative analysis provides with all the metrics needed in order to satisfy the spatial conceptualisations mentioned above.

Secondly, in order to achieve a comparable understanding between cases and types of analysis, all metrics corresponding to classification or framing dimension are acknowledged together per dimension. The metrics that are used in the model are rescaled from -1 to 1 (Table 1). The rescaling method has been implemented via RStudio in which for each unique variable it counts the maximum and minimum value of the sample (of the 10 schools). Thus, the method then rescales all values based

on the maximum and minimum values and the school with the minimum value gets a -1, while the schools with the maximum number a +1. Then all different variables used either for the classification or framing have been aggregated all together in order to create a variable for each dimension that takes into account all the different metrics and spatial conceptualisations that have been used to identify this dimension. Figure 1 shows the distribution of the different classification and framing variables per school and the dominant median value which is in fact the mean dimension of classification and framing per school. By looking at the distribution of values in relation to the spatial conceptualisations mentioned above, mean values above 0 denote weak classification or weak framing, while values below 0 denote strong classification or framing. Then the median value per dimensions has been plotted in a 2x2 matrix.

Variables addressing Classification & Framing

Educational Code Variables

Variables	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
GSI	-1.000	0.333	1.000	-0.333	0.111	-0.78	0.111	-0.56	-0.33	-0.111
Floor_Separation	0.058	0.249	0.786	0.726	0.223	0.85	-1.000	0.37	0.41	1.000
Axial_Choice	0.461	0.107	0.364	-0.144	-0.133	-1.00	1.000	-0.05	-0.05	-0.947
Axial_Choice_R3	-1.000	0.792	-0.675	-0.452	-0.088	-0.16	-0.251	0.96	1.00	0.525
T1024_Choice	-1.000	0.263	-0.563	-0.064	-0.493	-0.64	0.143	0.75	1.00	0.414
NACH_Mean	-0.254	0.491	-0.536	0.069	-0.128	0.21	0.052	0.50	1.00	-1.000
NACH_Max	-1.000	0.647	-0.529	-0.176	0.059	0.41	-0.059	0.18	1.00	0.176
FIR_Sports	0.254	-0.360	-1.000	-0.392	-0.678	1.00	-0.628	-0.19	-0.75	0.132
Axial_Mean_Depth	-1.000	0.249	-0.852	-0.188	-0.036	0.57	-0.958	0.53	0.17	1.000
Axial_Integration	-1.000	0.271	-0.931	-0.454	-0.228	0.18	-0.773	0.71	0.14	1.000
T1024_Integration	-1.000	0.464	-0.525	-0.463	-0.642	-0.36	-0.301	0.59	1.00	0.782
Step_Depth_Admin	-1.000	-0.553	0.259	-0.322	-0.982	0.11	-0.063	0.21	1.00	0.478
FIR_Admin	-1.000	0.538	0.538	1.000	0.310	-0.18	0.594	0.83	0.04	0.178
Isovist.Perimeter	1.000	-0.798	-0.506	-0.731	-0.917	-0.64	-0.971	0.71	-1.00	-0.474
FIR_Spe_Classrooms	-1.000	0.438	0.023	0.085	0.964	0.15	1.000	-0.47	-0.70	0.836
FIR_Gen_Classrooms	-0.528	-0.024	-0.024	0.367	0.319	-0.67	1.000	-0.74	-1.00	-0.082
FIR_Cantine	0.697	0.714	0.714	0.579	-0.123	-0.32	0.108	0.50	1.00	-1.000
Visual_Mean_Depth	1.000	-0.221	0.022	-0.224	-1.000	0.51	-0.569	0.50	-0.42	0.138

Table 1: Variables defining the educational code

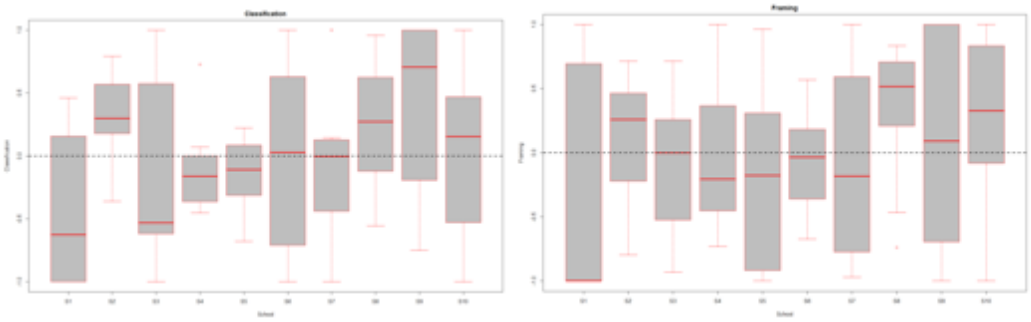

Figure 1: Distribution of Classification (left) and Framing Dimensions (right)

Thirdly, an in-depth investigation of two schools through on-site observations gives contextual knowledge in order to examine whether social actions and decisions that could shift the two dimensions and thus the educational code. This process aims at verifying the hypothesis of this paper that school building is social-spatial whole constantly in the process of making. The observations methods that have been used include snapshots and semi-structured interviews with students, teachers and headteachers.

3.2 Case Studies

In order to test this framework, ten open-air secondary schools built in Cyprus after 2000 serve as case studies (Figure 2). The selection stems from the fact that open-air schools are remarkably under-investigated and there is currently no study in the field of space syntax that analyses open-air schools. At the same time, the end of the 20th century and the beginning of the 21st century has marked one of the most pivotal periods for education and the design of educational buildings in Cyprus.

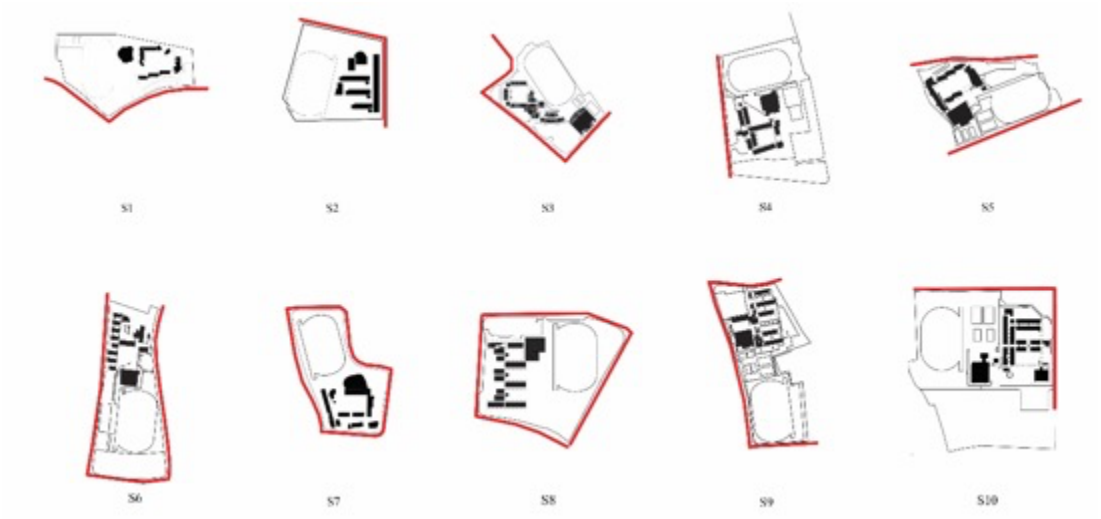

Figure 2: Secondary School Built in Cyprus after 2000, black colour: close areas, white colour: open areas, red colour: road system around

All 10 schools of the sample have been built by various independent architects under the supervision and general organisation of the Technical Department of the Ministry of Education and Culture. Half of the schools in the sample were built in 2002 (S3, S5,S9) and 2003(S1,S10). S2, S4, and S6 were constructed in 2005, 2006, and 2009, respectively. The two most recent lower secondary schools built in Cyprus were constructed in 2011 (S7 and S8 both in the same city). Lastly, schools of the sample can be classified into two building types: courtyard-based and hierarchical-based schools. Courtyard-based schools can be considered schools that their design is defined by one central courtyard (S1, S3, S4, S5, S7). On the contrary, hierarchical-based schools are defined by smaller courtyards and linear, more grid-like circulation systems (S2, S6,S8,S9,S10).

4 RESULTS

The results section is structured as follows. It firstly discusses the educational code that is suggested by the schools' layouts based on the list of spatial conceptualisations that is derived from the literature review and additional assumptions by this study. Secondly, it discusses the role of agency in shifting the educational code.

4.1 Educational codes & forms of solidarity: A holistic syntactical approach

Based on the unified framework that is explained above, the schools can now be placed in a 2x2 matrix (Figure 3) with the degree of classification on x-axis and the degree of framing in the y-axis. The strength of those two dimensions is found by calculating the average value of all conceptualisations per dimension (i.e classification or framing) as explained in the methodological chapter. Hence, by plotting the average values on the diagram, the educational code suggested by the layout of each school can be revealed. From the figure below, three distinctive patterns can be identified. Firstly, S2, S8 and S10 are placed on the bottom left quadrant. S4, S5 and S1 are located on the upper right quadrant, while S9, S6, S3 and S7, are attached either on x-axis or y-axis. Schools placed on the bottom left quadrant are characterised by weak classification and weak framing and thus an overall integration code (S2, S8, S10), while schools placed on the upper right quadrant are characterised by strong classification and strong framing and hence a collection code (S1, S4, S5).

Schools that occupy the x-axis or y-axis axis have exceptionally high one of the two dimensions, while the other is primarily neutral. This, therefore, suggests that S9 is primarily weakly classified but neutrally framed. S6 is placed almost in the middle of the matrix since both dimensions are almost neutral. S3 is strongly classified but neutrally framed, while S7 is strongly framed and neutrally classified. Hence, this might suggest that those schools do not construct a robust educational code.

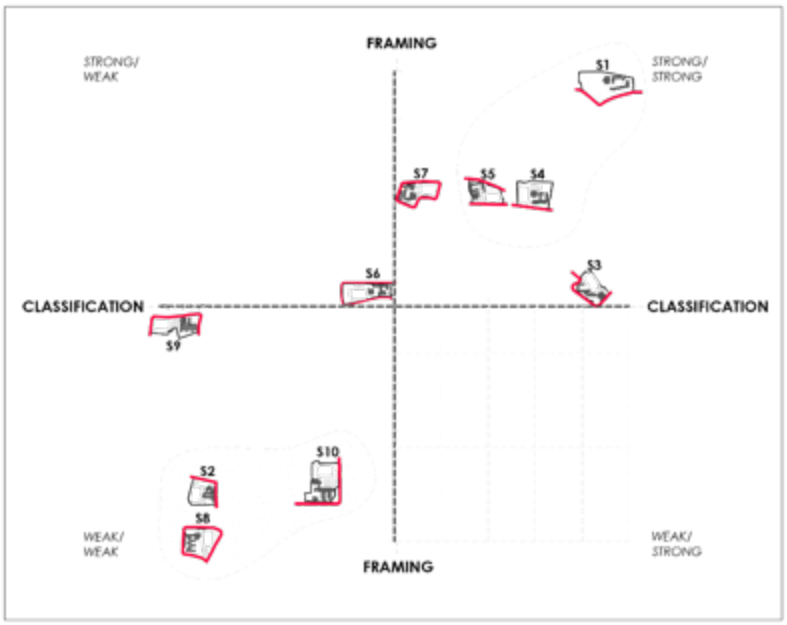

Figure 1:Educational Code Suggested by the Schools' Layouts

Thus, it could be argued that the profile of each school based on the educational code is the following:

• **S1** has strong framing and strong classification and thus a **strong collection code**;

• **S2** has weak classification and framing and thus a **strong integration code**;

• **S3** has relatively strong classification and almost neutral framing and thus a relatively **weak collection code**;

• **S4** has moderate to strong classification and moderate to strong framing and thus a **moderate to strong collection code**;

• **S5** has moderate to strong classification and moderate to strong framing and thus a **moderate to strong collection code**;

• **S6** has slightly weak classification and neutral framing and thus a **very weak integration code**;

• **S7** has almost moderately neutral classification but strong framing and thus a **weak collection code**;

• **S8** has weak classification and framing and thus a **strong integration code**;

• **S9** has weak classification and almost neutral framing and thus a **weak integration code**;

• **S10** has weak classification and framing and thus a **strong integration code**;

Considering this type of analysis with the formal types of the schools it can be seen that all schools that fall into the bottom left side, and thus form an integration code, belong to the hierarchical-type of school (as classified in chapter 3). In contrast, schools that belong to the upper right quadrant are courtyard-based and primarily collection code.

Such an understanding is particularly controversial at first sight, since S2, S8, and S10 are all spatially hierarchical and strongly ordered layouts, while S1, S4, and S5 are all courtyard-based schools and thus offer a less strongly ordered school layout. However, if all the spatial conceptualisations are considered, additional light could be shed on this controversy. In particular, the list of spatial conceptualisations that is considered for identifying the educational code does not only consider the spatial layout per se but also other dimensions. Specifically, it considers the density of the scheme, the centrality of functions in the school, the movement potentials as well as the visual prospects that are offered. Therefore, the spatial order of the school unit is just one of the dimensions that are considered among others.

It could be also highlighted that the spatial layouts of S2, S8, and S10, which are primarily integration code could offer a base for a non-correspondence school community, where spatial location and social labelling do not overlap. On the other hand, schools such as S1, S4 and S5 that offer a more collection code it could be argued that point towards a correspondence model where spatial location and labelling overlap. As regards the remaining schools, the profile of the school community that is suggested by the educational codes is not clear, since the educational code is not robust and clearly identifiable.

4.2 The dynamic potential of the framework

Going one step further, the aim of this section is to address the dynamic potential of the framework as well as the degree to which the school environment can be considered as a socio-spatial whole constantly evolving. Hence, to show that the educational code proposed by the school's layout can be shifted by means of agency and rules application. In order to achieve that, it compares two schools (S2-S9) to identify the degree to which a common social action that has been applied by both schools' headteachers can shift the school's educational code that is described earlier.

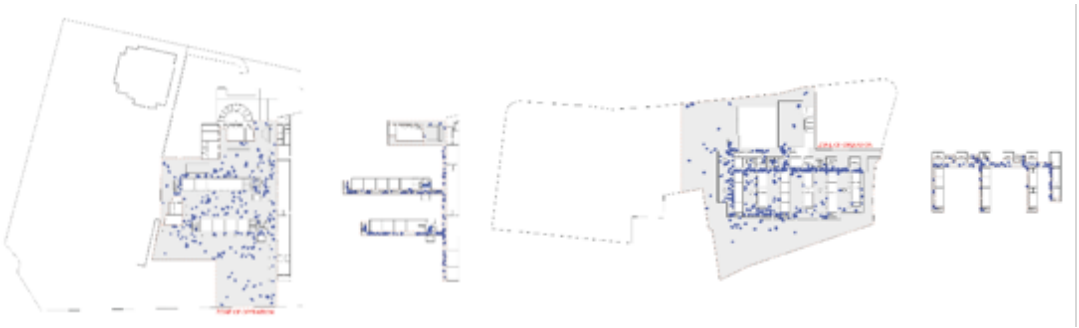

Figure 2: Zone of Operation with rules Application in S2 (left) and S9 (right), Blue Colour: moving individuals, Grey Colour: zone of operation, White Colour: school building and its open spaces

The common strategy that is implemented by the two headteachers has been to eliminate completely the sports area from the main school unit to be able to control better the school community (Figure 4). This social action has significantly changed the school's spatial structure. Specifically, this action has:

• defined smaller areas for students during breaks;

• influenced users' distribution in the school as well as the spatial potentiality of the school;

• differentiated the relationship between built and unbuilt space, since it excluded the whole open area from the entire school unit;

• influenced students' and teachers' zones of operation;

Variables Addressing Classification & Framing

Educational Code Variables, After Rule Application

Variables	S2	S9
GSI	1.000	-0.100
Floor_Separation	0.111	0.417
Axial_Choice	-0.019	-0.064
Axial_Choice_R3	0.989	0.981
T1024_Choice	0.308	1.000
NACH_Mean	1.000	0.998
NACH_Max	0.529	1.000
FIR_Sports	-0.070	-0.775
Axial_Mean_Depth	0.338	0.182
Axial_Integration	0.341	0.067
T1024_Integration	0.681	1.000
Step_Depth_Admin	-0.489	1.000
FIR_Admin	0.077	0.050
Isovist.Perimeter	0.069	-0.688
FIR_Spe_Classrooms	-0.240	-1.000
FIR_Gen_Classrooms	0.517	1.000
FIR_Cantine	-1.000	-0.506
Visual_Mean_Depth	-0.960	-1.000

Table 2: Revised Variables by considering the social rule that has been applied to S2 and S9

On this account, all metrics mentioned earlier have been re-calculated by excluding the sports area. The complete list of the re-calculated and re-scaled variables is presented in Table 2. The educational code is then re-examined, compared, and contrasted with the original code that has been suggested by considering the given spatial layout of the school. Lastly, it is schematically placed in the 2x2 matrix (Figure 3) where a shift from the previous code can be identified. Specifically, by excluding the sports area, both schools have enhanced their framing by controlling the interface between users, users' distribution and by restricting the space. Subsequently, this shifted image suggests that school 9 moves towards a correspondence school community, but again this is not predominant, and that S2 still complements a non-correspondence school community but not as robust as earlier.

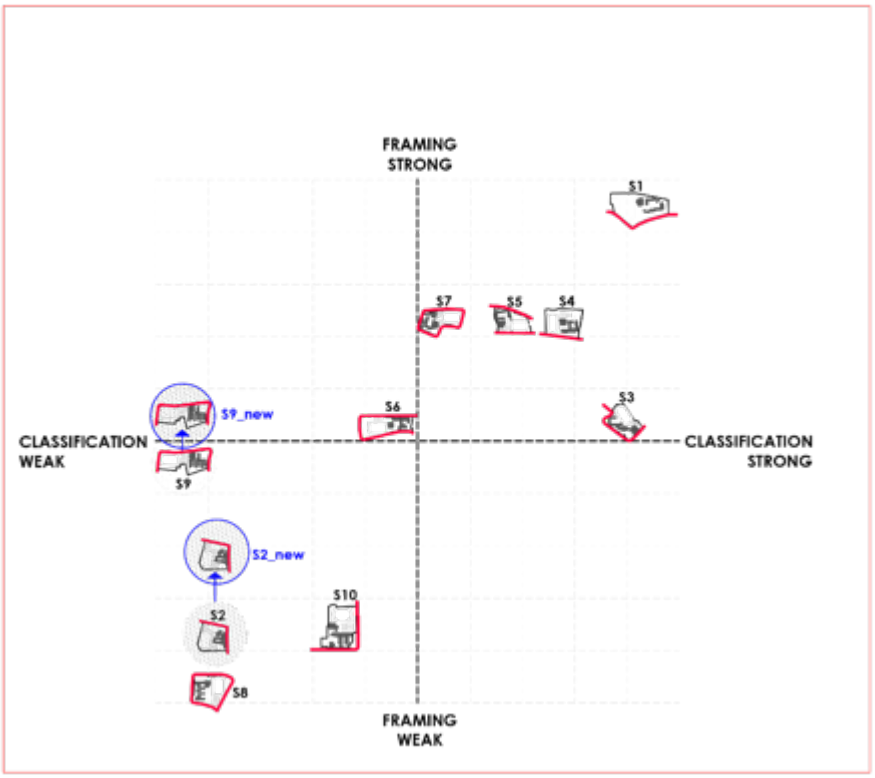

Figure 3: Shifted Educational Code for S2 and S9

5 CONCLUSIONS

Drawing on pedagogical theory of Bernstein, existing syntactical studies and assemblage theory, this paper has developed a framework to describe and discuss the educational code of a school and the potential school community. The framework provides a useful lens both to achieve a holistic translation of Bernsteinian concepts to space but also to render schools are constantly evolving.

Thus, the contribution of this study, it is firstly methodological. It lies exactly on the provision of this framework that is based on existing scholarly work but is flexible and adaptable to each researchers' spatial conceptualisations and can embrace more than two dimensions at a time.

Secondly, its contribution is also conceptual. It offers a broader understanding of school environments by highlighting their complexity and temporality. In that sense, this study instead of focusing only on the physical form per se, it highlights that the school's spatial structure is not stable in time despite the apparent stability of the physical form. In that sense, this relational conception of space offers an alternative understanding of material and immaterial aspects in the study of built form. The consideration of the assemblage theory has enabled to understand that "space [has to be considered] as

constantly changing, as an outcome of the specific mutual relations between people and places and their contexts" (Tornaghi and Knierbein, 2015, p.244). Specifically, it has revealed that even though the school's built form has appeared to be stable morphologically, there is a certain fluidity in the way socio-spatial dynamics are evolved in space and differentiate the configurational structure of the layout. Thereby, it is becoming apparent that even though the physical form of the school building itself might have been not changed, different socio-spatial dynamics could challenge the 'flat' ontology of space.

Thirdly, this study is also significant for the specific context of Cyprus. It is critically engaged in the evaluation of open-air schools with space syntax methodological tools, and it is the only study that examines systematically the socio-spatial structure of schools in Cyprus.

Limitations of this study include the restricted number of empirical data. Only two schools have been selected for the in-depth study, and thus, space usage data have been collected only from two schools. Therefore, this study could have benefited from a larger sample size. Additionally, the variables considered for the identification of the educational code provided by the layout are only spatial. Hence, this study would have been benefited by the consideration of additional socio-educational data such as the students-teachers ratio, school's policies, timetable etc.

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