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Extended summary

Architecture for the elementary school, an essential spaces for life experiences

School building evolution and its typology

Curriculum: Analisi e Progetto dell' Architettura e del Territorio

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Abstract.

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The research on architecture for the elementary school, intended as an essential living space, aims to focus on the relationship between physical space and its intended use.

The historiographical analysis of the scholastic legislative system has provided a frame of reference which serves to outline the features of the learning environment.

The repertoire of school buildings under examination has contributed to the creation of an Italian architectural language.

At the same time it was possible to study legislation carried out by technicians. Their work has been centred around a sense of social responsibility which, in turn, has facilitated the diffusion of

new models of scholastic buildings that are to set the standards of hygiene in a welcoming and healthy environment and which should be seen as "signs of civilisation".

At times, however, innovative didactic and educational principles were not carried out in architectural projects.

In fact the study of a relevant sampling of schools has revealed that scarce attention has been paid to the single class-room itself, in spite of its being the fundamental unit, present in all schemes of spatial aggregation dedicated to teaching-learning activities.

It was found that the weak element of the class-room space was that there was no connection between the physical environment and its end-use or function with scarce consideration given to acoustic comfort (the intelligibility of speaking and listening), which is an essential element for the spaces' typification.

Organizing the educational setting must be based on in fact good environmental conditions so as to enhance communication and avoid any dysfunctions in the learning process or in voice use.

For this reason, when designing the single class-rooms, greater attention must be paid to the acoustic quality and its relationship to school environment and specific activities typical to schoolchildren.

Keywords. Evolution, typology, unit-classroom, acoustics, balanced design.

1 Problem statement and objectives

Research involving elementary school architecture, a life experience space, originated with the attention drawn to the Italian situation, characterised by its emphasis on skill-acquisition as well as the socialisation of individuals which serve as reference points for the entire community.

The study of data and the dynamic relationship between architectonic product, user, didactic model and the school system's aims in a significant arc of time spanning the Unification of Italy to 2012 has been the focus for all *ex novo* planning and design as well as for adaptation or upgrading of existing scholastic buildings.

Once having established what the typological characteristics such as lay-out or organisation in space, function and compositional aspects were, it emerged that the use of a single characteristic and exclusive class-room space is the primary typological trait of the Italian school system while the ergonomic-acoustic aspect is the fundamental factor for interaction between architectonic environment, didactic function and receivers decisive in guaranteeing appropriate perception, communication and interpersonal relations.

2 Research planning and activities

Recognisable building typology or type from the genesis across various historical phases has been demonstrated by presenting the historical lines of development through examples and is furthermore based on citing various regulatory legislation in existence past and present. Finding the matrix (that is the very definition of a school's resulting physical form which is in turn a synthesis of spatial organisation, function, communication and spatial-temporal, spiritual and human values or non-values) was the first piece of interpretive evidence where 'architectonic complex' could be seen as architectural type.

Historical research method used involved**:**

° the analysis of source material recording Parliamentary proceedings in the historical archives of both the Senate and the House of Deputies, as well as laws on record in the *Official Gazette (la Gazzetta Ufficiale).*

° visiting the remains or 'traces' of schools, designed by significant architects, still in existence or standing in Italy.

° cartographic research done in historical archives and libraries in reference to elementary schools designed and built during many different historical periods.

° acquisition of maps, land registry documents and blueprints kept in Municipal Land

Registries and Building Departments as well as in the National Archives.

° analysis of publications on Maria Montessori

Research has clearly shown a relationship between political leadership and the orientation of schools formed by those precise intentions. Comparing blueprints drawn with analogous use in mind in a variety of different places and periods enabled the reconstruction of and finally the progressive affirmation of a spatial distribution plan more than a proper building typology as such. The attached atlas presents a *repertoire* of analytical charts and pictures of buildings from varying historical periods.

The study demonstrates, by identifying from the outset a building matrix, the influence of the 'confessional' typologies or type, both religious and for detention that have marked the formal and functional development of school building design.

The speciality of the Jesuit Order in organising the distribution of space or lay-out by activity and by subject in a school is seen in its *Ratio Studiorum* where procedures and principles were laid out and which was consulted as reference for various European countries.

In Italy at the beginning of the 20th c, the government involved engineers like the Jesuit Luigi Secchi, author of a work on building model classification destined to schools. Characteristics of the school building from the start corresponded to educational principles and the necessity to give a multitude of children the rudiments of literacy and learning. Unlike convents, even though used as models for the spatial lay-out, the school was not meant to furnish shared and communal spaces so much as to articulate the isolation of the classes one from the other. Communal entrance halls or foyers were soon to be eliminated. In particular, it was during the Giolittian epoch that the elementary school became widespread throughout the country.

Building a people's identity was one of the aims of architectural language. Where buildings were to be built agreed with the role assigned to the institution recognisable in rigour and stylistic sobriety contributing to the quality of the urban setting or landscape.The period from 1922 to 1943 represented for Italian architecture a phase of contradiction and ideological contrasts, even if still within the limits set by the Regime. International expositions allowed for confrontation between countries making the push forward to innovation easier on its way to defining an Italian style. Yet the capillary diffusion of schools considered as institutions founded to educate and train Italians still conformed to old models.

However, in response to new ideological demands and the political program, the school building did take on an extremely severe aspect as those spaces dedicated to assembly meetings and official events took on particular importance. Rationalism in its varying urban context subsided with the parameters laid out by new design and city planning programs. The famous architect Gaetano Minnucci contributed to this spread of modern criteria carefully enumerating values and indications regarding comfort. This renewed model, especially for furnishings and installations, did not present though any modifications in the arrangement of space and the class-room, unchanged in its original quadrilateral form, was reduced in size to hold a lesser number of students (50-1 teacher). It was the remarkable contribution of certain Italian as well as foreign educators, and in particular that of Maria

Montessori (medical doctor and educator), that showed just how strong the link is between education and the child's environment as a living and learning space.

Attention to cleanliness in childcare was confirmed by the establishment of school districts either in towns or in healthy environments;

Montessori's most significant intuitions did not only concern physical well-being, but above all were relevant to the possibility of balanced and harmonious growth in a lived-in environment while respecting the child's own innate capacity to socialisation during the natural process of gaining control of his or her actions.

Many examples of buildings designed by important architects used the language of rationalism as far as the synthesis of volume, linear and stylistic simplicity was concerned, but the introduction of an internal spatial distribution criteria characterised by functional versatility was found in but a few sporadic cases, unlike the standard (linear) configuration scheme of class-rooms.

L.Lombardo Radice proposed one of the educational models worth mentioning here: he called for the spread of a 'joyful school' which is the basis of some schools found today in Italy, especially in Emilia. Innovative ideas calling for renewal after WWII came from both Europe and America and pushed to abandon the traditional system. The school's form became clearer yet more complex, responding to the demands of the concept of an organism appropriating a space where relationships were destined to construct a social identity founded on collaboration to bring out the best qualities in the individual.

It was the *Ministry of Education's Study Centre for School Architecture* directed by Ciro Cicconcelli that after 1952 should have eliminated, once and for all, school models such as the linear class-room scheme or the court-yard scheme. The decline though of the traditional type was hardly apparent. The opening of the school to the community in some rare cases modified the building's relationship to the urban surroundings involving a more global flexibility adaptable to a variety of dimensions and spaces for various functions. Schools in these cases became poly-form organisms without hierarchy, projected into an urban context. The variations in economic interests and new development programs seen especially from 1970-75 gave public buildings the role of upgrading the urban landscape of degraded areas while raising the index of what could be built, and what could be built *on,* regulated by new legislative dictates. This was the beginning of massive lotting.

Buildings were more and more schematic and standardised presenting, besides the single and repeatable class-room unit in which to teach, the newer single work-shop unit for sport, the school meals, library and auditoriums to be used by members of the community (the pedagogical unit).

With the introduction of new programs in 1985, and five years later in 1990, the elementary school was transformed: functional nuclei were formed to establish a relationship between the pedagogical-units; those reserved for teaching and those for recreation. This relationship was meant to be organic both with the recreation spaces and with those spaces destined to class-room didactic interaction.

The 2009 reform, along with the 2012 ministerial directives for elementary schools, have reconfirmed the single-teacher model, and raised the number of students per classroom to 25 and established the function-unit while specifying what the activity of work-shops and laboratories are.

Since the school has been defined as a civic centre of permanent education and cultural integration, in part because of the weaker orientational role the family has, the school will be opened up to all community members and the flow of people of different age groups with a therefore different conception of its function and use will be seen.

While recording the permanent characteristics and variables of the last 150 years, one can find the constant presence of the single class-room unit. The Task Analysis Ergonomic Model permitting the discovery of the most important points to be made about environment in relationship to its users. The study of these Task Analysis results, in particular in reference to the interpretative method and establishing what the critical points are in a learning situation, were furnished by the Ergonomic Institute of Ancona and proved to be very useful in the study of the link between environment and learning-teaching, function and efficient sign and information emission.

As can be seen, architecture as sign, signifier and above all effect produced on inhabitants was the question which needed to be answered and demonstrated.

The objective was to reconstruct the process typifying the architectural form of schools without forgetting the dynamic relationship existing with its users. Identifying the influence of a building on its inhabitants is the focus of the second and third chapters. So as to adopt the correct approach to environmental psychology Professor Marco Costa was consulted and gave advice on what research methods were to be used.

For procedures used to study environment and its users, it was found that in the classroom space the acoustic comfort element is particularly relevant since in schools today listening and speaking are proper integration and personal relations factors in their own right.

Though direct research into acoustics in schools revealed difficult, a Le Marche company '*Estro Armonico*' in Corinaldo will be forming a network of acoustical engineers who can share information on screening research done recently in several elementary schools.

Professor and acoustic engineer at the Italian CNR, Mario Mattia of the Sapienza University in Rome was in contact with Professor Michel Vallet, author of research in psychoacoustics conducted for the French CNR where he has shown how the negative effects of an acoustical environment without carefully planned acoustics results in damage to learning and has devastating effects on behaviour

3 Analysis and discussion of main results

The case study from the acoustic survey in a class-room, is reported as an example of potential dysfunction in human voice propagation and speaking intelligibility, which are fundamental physical aspects for communication and the prevention of childhood hearing disturbances.

The studies have shown the critical points of an environment in sound transmission and difficulties in reception, reduced attention span and other consequent learning disturbances in children.

The learning environment in general should have been designed to avoid such disturbances and not be the cause of them.

The morphological analysis of the school building has made possible the identification of, in some historical periods, a coherent link between the school aims and the modes of behaviour required and the use of space assigned to each individual.

It is necessary to conclude that at present the school is a strange and dysfunctional place with a very limited possibility of guaranteeing safety and comfort according to the standards of schools today.

The research concerning the very identity of a place and the perception of architectonic values was aimed at finding in the work of anthropologists and architects alike a link between architecture and vital energy as well as between emotional disposition and the defence of individual and group identity.

Seizing the semantic aspects of a building that work together to constitute an infra-language and a language, emphasizing the value of the perceptive capacities in childhood, has permitted us to consider the building as the first vehicle of the learning process and the well-being of children and adults. Although causes are often unknown, learning disturbances can be attributed to perceptual alterations and not just to neurological or sensorial organ damage as causes of distorted reception and incomprehension of speaking.

The urgent necessity to evaluate this problem so as to take measures to improve school buildings is leading researchers from several European countries to participate in the international convention promoted by the *Italian Acoustics Association* that will take place in Meran, on 18. 03.2013.

The theme of the convention is acoustics in schools, with particular reference to the causes and effects of scarce speaking intelligibility in an environment with poor acoustics.

4 Conclusions

Loud background noise is bothersome at school. The speaker has to raise his or her voice and the listener is unable to concentrate properly. The need to be able to listen, allowing for reciprocal understanding of participants, just like the necessity for silence and concentration do, are all crucial to good teaching and learning. The variety and different gradients of sound stimuli can strengthen the perceptive capacity in childhood and are useful for the enrichment of sensory experience as well as the recognition and awareness of the value of a place.

The architect can transform limits dictated by the necessity for elevated and differentiated acoustic quality into motives for the design unity of a work when choosing materials.

Acoustic as well as speaking quality should both be included in comfort parameters which are indefeasible to active perception, orientation and well-being in a living space. Children have co-existing contrasting needs. For example the need for interaction alternating with the need for reservation, reflexion and exploration. Diversification in the emotional climate requires spaces that are not limited to a single unit, whether they be class-rooms, work-shops or laboratories. Plurality and integration of spaces should be for the exclusive use of each class group, articulated as an organism contiguous with common spaces. The external natural environment where experience can become one of real, autonomous discovery must contribute to the multiplicity of sensory stimuli. Being able to fully experience and participate in both internal and external space with different characteristics, the relationship between the participant and the environment is, whatever the activity, always proxemic, cognitive and emotional. According to recent ministerial directives, the restoration of the class-room, work-shop or laboratory unit currently involves a peremptory subdivision of activity and discipline that separates rather than unifies the learning process or experience at the same time recreating a situation without basis in reality.

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