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# EDUCATIONAL ARCHITECTURE FOR CHILDREN WITH MENTAL DISABILITIES. REFLECTIONS BETWEEN THEORY AND REALITY

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## ABSTRACT

*The article aims to demonstrate the roles that an inclusive educational center must fulfill to positively influence the cognitive development of children with mental disabilities. The physical reality of the architectural space of three educational centers destined to serve children with mental disabilities in Lima - Peru is described. It is concluded that inclusive schools must become a physical environment that serves as part of the educational method, facilitate the perception and sensation in children's learning sessions. They must be bioclimatic and biophilic and finally be active actors for the synergy of learning.*

**Key words:** alternative education, interior architecture, learning disability

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## 1. INTRODUCTION. ARCHITECTURE, EDUCATION AND DISABILITY

Disability in Peru has several problems that have not yet been solved. Despite the fact that society and politicians have come out in support of the disabled, this problem cannot be

completely eliminated due to the constant obstacles it presents (OMS, 2011). A person with disabilities cannot develop freely in their different stages of life, especially because, even though there is a national building regulation, popular architecture and perhaps also the city, does not consider them. This article focuses specifically on understanding a type of architecture: inclusive schools for people with mental disabilities. At first, because although infant mortality has decreased, the number of *years lived with disability* has increased by 4.7% in 2017 compared to 1990 (GBD 2017 Child and Adolescent Health Collaborators, 2019). Secondly, because Peru needs a paradigm shift in education: abandoning special education, still in force in its laws and name of institutions (DIGEBE, 2012), to move to inclusive education. For this purpose, people with Down syndrome, Asperger syndrome and autism are taken as study elements.

Given the relationship of cognition with architectural space (Martínez, 2012) and since people's knowledge is built from society through socio-cognitive conflicts (González Pérez, 2005), then, architecture -being the scene of human activities - has a categorical role in people's learning process. With greater responsibility, inclusive schools must be designed considering the application of educational models whose main objective is the adequate development of students with a mild, moderate or severe disability. For example, if the *Etievan* educational model is considered, the human being, being conceived by mind, feeling and body (Jiménez Avilés, 2009), must inhabit projects that have considered anthroposophic design (Steiner, 1961). That is, the ideation of this type of architecture not only rests on reflection on the physical and functional qualities of the building, but on the emotional and even the human.

For this reason, the design of the environments should help the cognitive increase, creativity and perception of children, allowing them to explore, physically and emotionally, the space that surrounds them. Likewise, during design, the creativity of each type of user must be taken into account so that they can adapt the spaces to their different needs. Flexibility, therefore, becomes essential for every child to create different experiences in the same place through the form and function of the building. Reconsidering the pedagogical model as a conditioning factor of the architecture, therefore, the functional distribution that the building possesses must be the product of reflection on how the physical, expressive and symbolic characteristics influence the behavior of users. In this way, through social interaction in the built space, it will be possible to achieve the synergy of the building design with the educational model (Romaña Blay, 2004), consequently, architecture will become part of the pedagogical strategy (Toranzo, 2007).

For this reason, a center will be inclusive when its design circumscribes environments that collaborate with the cognitive development of children, taking into account their physical and cultural conditions, among others (Hermoza Alarcón, 2013). A building, especially an educational one, must not only consider a pedagogical functionality, but must have in itself the ability to educate. In other words, architectural spaces have to generate different ways of learning, not only in classrooms, but from the different environments of the project, including those that will be used for leisure and recreation. Consequently, the structure and shape must respond to the space and its educational role, facilitating the activities carried out in it.

For the design of these spaces it is important to bear in mind that there is a great difference between the way of thinking of an adult to that of a child (Laverde, 2014). Therefore, it would be a mistake for an architect to design a school taking into account only the educational paradigms that he deems appropriate for the school since his ideas are not necessarily sufficient for the adequate learning of children with mental disabilities. For this reason, children, and their teachers, must be actively included in the creative processes of the architectural object: if the current paradigm of education is student-centered in the same way, architectural design must be through the active participation of them. Likewise, although users who go to schools that are properly designed and built regarding their lighting, temperature, air quality, spatial

configuration and acoustic level have better academic performance (IDB Education, 2012), it is important to understand the qualitative aspects of architecture as part of children's learning phenomenon, specifically those with mental disabilities. The change in the student's cognition varies the teaching / learning process and, therefore, the final architecture should not have the same design criteria as a regular school. That is to say, the designer, besides thinking about the child during the creative process of an inclusive educational center, must also consider that the mental disability of the users that the building will house must mean a paradigm shift, not only to the educational model, but also to the school itself, taking into account, for example, that the lighting for children with all their cognitive abilities will vary when it comes to children with Down syndrome, Asperger syndrome and autism.

## 2. ADDRESSING THE PROBLEM

In Peru, it is estimated that 1,575,402 people suffer from some type of disability, which represents 5.2% of the total population (INEI, 2014). The departments of Moquegua, Tacna, Lima, Arequipa and the Constitutional Province of Callao have the highest percentage of users with physical or mental limitations. On the contrary, the departments of Amazonas, Junín and Loreto have the lowest percentage of the population with this type of disability, below 3.5% (INEI, 2015).

At the level of Metropolitan Lima there are 101 schools, called CEBE and PRITE <sup>2)</sup> (Ministerio de Educación, 2018), where 7,729 people of school age with mental disabilities study, a figure that approximates the demand (INEI, 2018) which is made up of the number of people. However, their designs do not respond to a pedagogical theoretical concern materialized in architecture, in other words, the practice moves away from the reflective level (Payà Rico, 2010). The instruments used to evaluate the inclusion scale contain indicators that leave aside architecture as a contribution to the educational development of people, especially when the users are children with disabilities. This problem is particularly worrying when it comes to buildings whose function will be to educate, even more so, knowing the relationship that exists at the city/education level (Muntañola, 2004; Tonucci, 1997; Norberg, et al., 1972) and, especially, at the architecture/education level (Escolano, 1993; Correa Zabala, 2016; Romaña Blay, 2004).

Education in North Lima –a sector of Metropolitan Lima that encompasses the districts of Ancón, San Martín de Porres, Comas, Puente Piedra, Los Olivos and Independencia– is under the commission of the UGEL <sup>3)</sup> and has the fewest inclusive centers at the metropolitan level. According to the number of inclusive schools that exist in North Lima (Ministerio de Vivienda, 2018) 40% of the school population with some disability in this sector do not have this type of institution, being the district of Los Olivos the one that has the fewest institutions to house children with mental disabilities. For this reason, this place was selected to carry out an investigation on the roles assumed by the architecture of an inclusive educational center in the cognitive development of children with mental disabilities, taking as a case study the Señor de los Milagros school, the PRITE school of Pro and the Centro de Estudio Misionero.

## 3. METHODOLOGY

The research is based on the study of three cases with a qualitative approach. The starting point is the description of each school that was selected through a non-probabilistic sample, however representative. While two of the schools have opposite social references –the Centro de Estudio Misionero, which has a better reference, and the Señor de los Milagros school, which, on the contrary, does not have an adequate reputation– the third, the PRITE de Pro, serves as neutral case. In this way, regardless of the value that society assigns to each educational center, the problem will be evident in each case, allowing theoretical reflection that supports the proposed

roles. Non-participatory observation was applied in each case, reviewing the formal, functional and structural aspects of each building.

Next, the opinion of teachers was collected regarding architectural spaces as elements to improve the cognitive development of children with special educational needs. For this purpose, interviews were conducted that were organized around four themes: the use of physical spaces as educational environments, the reactions that educational spaces generate in students, the physical environmental aspects of the institution's spaces and a synthesis of the basic conditions of educational physical spaces.

The total sample for the execution of the interviews was 30 people, all of them teachers from inclusive institutions <sup>4)</sup>, divided into three clusters. In the first place, the Señor de los Milagros school, which is composed of three male subjects (n = 3) and seven females (n = 7), with an age range between 30 and 45 years. The second is the Colegio PRITE of Pro, whose sample is composed of five male subjects (n = 5) and five females (n = 5), with ages ranging from 25 to 40 years. Ultimately, the Centro de Estudio Misionero, composed of four male subjects (n = 4) and six females (n = 6), between 25 and 35 years old.

Finally, with the information collected in the schools, the data obtained were interpreted to identify the roles of the educational architecture in relation to the proposed objective.

## 4. RESULTS

### 4.1. Non-Participatory Observation

The results of the non-participant observation of the formal, functional and structural aspects of each educational center are presented below.

#### *Señor de los Milagros School*

The shape of the building is rectangular, it has two floors, with an entrance for students and another private entrance for the administrative area and an open space in the middle, being the recreational place for children. The classrooms are also rectangular and small in size, they are closed, which makes lighting and ventilation very precarious, requiring the use of fans and artificial lighting, even during the day, to develop classes properly. The walls are in poor condition and there are no open areas.

The school has a low-level architecture with an infrastructure in a state of deterioration that does not promote the adequate interrelation between teachers and students, reduces freedom in the development of various activities due to the inflexibility of the architectural space, nor does it serve the cognitive development of children because it does not have, especially, therapy areas, activities that currently take place in classrooms, or areas for audio-visual stimulation, in addition to having a small patio.

#### *PRITE School of Pro*

The building has a central space used as a patio in which the children interact freely with each other, around this space are the classrooms, like the common typology of a Peruvian educational center, and a perimeter fence that does not allow to observe what happens inside from the street. In the courtyard, some small areas are intended for education, with the aim of changing the environment to generate different sensations in children. Likewise, the building, although it contains several functional areas aimed at sensory stimulation, does not have educational environments with technological equipment. A large percentage of the building is open space, although deterioration is observed in its structures. As for the classrooms, their shape is rectangular with a view of the courtyard, of regular size since it has a ratio of 1.40m<sup>2</sup> for each student, being 1.50m<sup>2</sup> the minimum recommended (CENEPRED, 2018). It has natural ventilation and lighting and its roofs are sloping, gabled, with calamine material that generates

a greenhouse effect inside that damages the thermal comfort of the people who use these environments. The colors on the classroom walls (in shades of very light pink) and the furniture it contains (in light blue and green tones) are very important for stimulation.

### ***Centro de Estudio Misionero***

The school is made up of four rectangular modules, with two floors each and parallel to each other: three of the blocks are intended for different educational levels (initial, primary and secondary) and the other for administration and common areas. Also, since there is a space between each module, three large courtyards that allow the interrelation of children are formed, where also workshops and other activities take place outdoors. The school, by having open and closed spaces that are adequately ventilated and illuminated, supports the stimulation of children. In this way, the educational center has 50% open area, additionally, its infrastructure is executed with concrete and is kept in good condition. Regarding the classrooms, these have a capacity of 20 people, they are large spaces (approximately 2.5m<sup>2</sup> for each student), which allow good circulation, and with flat ceilings. The colors of the interior spaces (white on the walls, with decorations in warm tones) are beneficial as they cause a feeling of dynamism, however, the absence of red tones is notable.

From the case studies observed, this school is the best example because it has the necessary open spaces and the study areas are in good condition, with adequate ventilation and natural lighting. The colors used cause dynamism which helps in the development and development of children.

## **4.2. Structured Interview**

The results of the structured interviews are presented below, condensing the opinions of all the teachers who teach in inclusive schools (PRITE and CEBE). The contributions that were identified are relevant insofar as they synthesize the relationship between architecture and the teaching/learning of students with mental disabilities. Although the educational architecture of the cases analyzed is limited to Peruvian regulations, their contributions are substantial inasmuch as those important aspects to consider for the design of future inclusive educational centers are pointed out.

### ***The use of physical spaces as educational environments***

According to teachers, cognitive development is stimulated through teamwork because, with it, the child interacts with his classmates and exchanges learning processes, which is why 100% of teachers indicate that they carry out this type of activity in a day of classes. Likewise, 75% of those interviewed consider that open spaces are one of the best places to develop team activities, since it gives the child freedom to express themselves and develop their knowledge. Meanwhile, the remaining 25% think that in a classroom it is easier to have control over the group activities carried out.

The next question is associated with the type of activities that are carried out, where and what is the motivation to develop them. All the interviewees assured that they divide the day between directed classes, free classes, leisure time, workshops and motor activities and only 35% included sport as one of the activities they carry out daily. On the other hand, while 75% of teachers use open and natural environments for group activities, adding that natural spaces provide relaxation for children, the remaining 25% believed that they served as a place for children to develop your leisure activities. In this regard, it was found during the observation that open and natural spaces were very important places for children and where they wanted to spend more time. According to the teaching format of the educational centers, 50% of the classes were directed activities and the other 50% were free activities.

***The reactions that educational spaces generated in students***

About how spaces affect children's emotions, 80% of teachers think that this relationship is direct, since, when students are in a closed place they feel more withdrawn compared to the larger spaces they serve for the stimulations of children, as well as the development of their emotions. Likewise, when learning activities are developed in the courtyards, moods of joy and increased activity of the students occur, in opposition, a more passive state occurs when the activities are developed within closed spaces, such as in classrooms, and even more if they demand concentration.

Regarding the physical characteristics of the classroom, 66% of the teachers stated that, sometimes, children cannot perform their activities freely due to the size of the classroom, which can generate feelings of frustration and withdraw. The remaining 34% mentioned that children are always encouraged to carry out the day's activities, meaning, this emotion is independent of the number of students per square meter in a classroom. Therefore, the opinion of teachers indicates that it is very likely that a classroom with larger dimensions (m<sup>2</sup> / student) will generate positive emotions in children with mental disabilities, in addition to well-being.

On the other hand, 100% of the interviewees answered that they prefer the color of the walls in white tones because it does not capture the attention of the students, while the classrooms where they develop motor activities are warm colors. This led to ask about the criteria that were considered to decorate the place where they carry out the activities. The 60% of the teachers affirmed that the classrooms are adapted by zones: on one hand, the works made by the children are used for the decoration -which serve as an exhibition-, on the other hand there are decorations alluding to the values that the institution believes it pertinent to instruct -for this purpose they use cut-out paper forming the letters that make up each word and images referred to, for example, respect, kindness, among others-, finally, there is the area where the educational materials of the areas of mathematics, language and science are found, so the decoration is made of melamine furniture. This variety in decoration allows children to be active in developing the different programmed activities and gives teachers the flexibility of the classroom to carry out different educational strategies. In contrast, the other 40% indicated that the decoration of the internal areas of the classroom is limited to furniture to place the students' work, therefore, there is no variety within the classroom.

To end this section, teachers were asked about the flexibility of the classrooms and 66% answered that these spaces did not have it. They related this concept to the possibility of adding other furniture to generate different activities because the spaces are small. The rest affirmed that they did have flexible spaces, since the school had workshop-type classrooms in which group work activities could be developed. Therefore, flexibility is associated with the varied use of furniture since these serve to properly apply different learning strategies that teachers design to implement in their classes. The classroom with the largest area per student and with flexible furnishings will contribute significantly to the learning development of children with mental disabilities. Likewise, the color of the walls are very important aspects since they influence children's emotions -for example, avoid colors in red tones to not alter children negatively-. In this way, it is necessary to reflect and research on the design standards of classrooms for children with mental disabilities. The cognitive and cognitive differences they possess will generate the need for new regulations for the design of inclusive schools.

***The physical-environmental aspects of the spaces of the institution.***

In the third part of the interview, environmental design principles such as lighting, temperature, ventilation and acoustics were considered. Regarding lighting, 66% of teachers assured that the classrooms are dark, which required the use of artificial lighting, however, in some cases, this

solution was insufficient. They also stated that dark environments cause lack of motivation and sleepiness in students.

Likewise, 30% felt that the classrooms were very hot due to the roofing material, which caused discomfort for both students and teachers. Another 30% commented that the spaces had an appropriate temperature, but sometimes, in summertime, the reflection of the sun made it uncomfortable in a certain area of the classroom. The remaining 40% said they had a comfortable temperature in the classroom, allowing an optimal development of their learning sessions.

Regarding ventilation in the classroom, it was asked if it was enough. The 30% of the teachers stated that the ventilation was bad, which is why they needed an artificial one, however, it was usually not enough for the summer season. The remaining 70% answered that proper ventilation was provided, which generated a comfortable environment and, many times, the heat could be controlled with the fans they had.

Regarding the acoustics of the classrooms, all the respondents highlighted the importance of keeping outside sounds isolated, especially to prevent students from being distracted. They claimed that noise disrupted classes and impacted children's concentration.

### ***Synthesis of the basic conditions of educational physical spaces.***

Most of the teachers stated that the spaces that their educational centers have for learning are classrooms, workshops, libraries and recreational space, 35% added that they also have sports courts. As a final question, they were asked about *what spaces, colors and textures in school children like*. All answered that the students like large rooms with good lighting and ventilation that have warm colors, however, avoiding red and its different shades. They also stated that children really like the variety of colors. Finally, they considered that a school will be better designed as soon as its different environments are open and in contact with nature.

## **5. DISCUSSION**

Once the description of the schools studied has been achieved and after conducting the interviews to obtain information on the experiences of the teachers, four roles that all inclusive educational architecture must have are proposed.

### **5.1. Physical Spaces for Education**

A first role identified, which is even general for all schools and which, however, must be assumed with greater emphasis in inclusive schools; is that architectural spaces should serve as part of the educational method. To this end, it is necessary to know how the different abilities and limitations of each type of disability, specifically the mental one, restrict the building –as well as physical disability, for example, through universal access, conditions the building–. In the same way, during the architectural design of an inclusive school, the relationship that human beings have with their built environment should be considered, especially when they are schools that will serve for the learning of children with difficulties to learn. In this way, the concept of inclusion will be evident not only in the building but in all the stages of its design <sup>5)</sup> for this purpose it is appropriate that there is constant participation of the main actors: teachers and, if possible, children with mental disability. Thereby it would be more likely to achieve the desired stimuli in the teaching/learning process (Laverde, 2014) and, therefore, children would be benefited in their education.

According to the interviews carried out with the teachers, and the non-participatory observation carried out in the schools, it is concluded that the educational centers should have open spaces that allow interaction between children. Considering that space is the place that human beings inhabit and where they achieve identity (Berroeta, et al., 2015), then, it is possible

to affirm that architecture, through its spaces, influences students. Additionally, for the building to serve as part of the pedagogical strategy in the education of children, the architecture must not only be optimal visually <sup>6)</sup> but also the architectural spaces of the schools - at least those directly related to the activity of educating- must have qualities of flexibility <sup>7)</sup> and openness towards the outside.

By establishing a learning relationship between people and their environment (Vielma & Salas, 2000), didactic experiences are created through constant learning in interaction with the sociocultural environment, in particular for the present research, this experience begins as soon as the children access each learning space in their schools. Finally, by becoming aware of the architectural requirements of a child with mental disabilities, it will be possible to achieve a comfortable architecture –physically and visually– that serves for the optimal development of teaching/learning processes.

## **5.2. Perception and Sensation of Educational Environments**

A second role that an inclusive educational school must have is subject to the perception and sensation that the building causes in children. The human being experiences reality from inside the world, particularly, children with mental disabilities will also do so from within their schools -in addition to the city and other built buildings-. In the constant interaction of the human being with his environment, that is, of the children and teachers with the learning spaces, the environments will change at least in terms of furniture and decoration.

On the one hand, the architectural space of schools must generate comfort and safety for children and their teachers, to ensure greater benefits in teaching (Arias Yévenes, 2013). An educational space for children with mental disabilities, even more so, should promote not only the imagery of the ocular, but also encompass all the senses, in a way that allows children to enhance their skills (Laverde, 2014).

On the other hand, considering that the way human beings process information is in relation to their neuropsychological development <sup>8)</sup> as well as their consciousness and awareness, schools must adopt contemporary educational theories for their design, such as neuroeducation, which allows to reflect on architecture as a neuroeducator. Therefore, children's environments for learning must serve for cognitive training, because they are in a stage where they learn from the environment they inhabit.

## **5.3. Physical-Environmental Aspects of an Inclusive School**

The third role that an inclusive educational architecture must have consists of the intrinsic relationship that the physical environment has with education (Mokhtar Noriega, et al., 2016). Given that during the interviews carried out, the teachers considered that the noise, the poor quality of the lighting and ventilation impaired the optimal development of the learning sessions -in addition to causing discomfort in the children- it is estimated that in an inclusive school education will be more optimal if lighting, temperature, ventilation and acoustic level were considered in its design: bioclimatic aspects that used properly will serve to improve student performance (IDB education, 2012).

Consequently, all educational architecture serving children with mental disabilities must be a bioclimatic building. Likewise, given that teachers positively valued the influence of natural spaces on the behavior of children with mental disabilities, the different spaces that schools have, mainly outdoor spaces such as courtyards, must be products of biophilic design.

## **5.4. Synergy of the Educational Space**

Finally, given that architectural spaces serve to develop people's identity (Berroeta, et al., 2015) as well as it is in relation to cognition (Martínez, 2012) and children's learning (Vielma & Salas,



2000) , then, the educational building acquires a fourth role: to be an active agent in learning. However, specifically schools for children with mental disabilities, together with teachers and students, must facilitate a synergy of learning through the creation of a sociocultural environment (Vielma & Salas, 2000), at least in the classroom.

This fourth role consists in understanding that the different environments of schools are social spaces that strengthen the capacity for coexistence and allow feedback (Laverde, 2014) for both the student and the teacher. The school and its learning spaces, through their materiality, interaction with the environment and adaptability, give the teacher the opportunity to promote the creativity of infants with mental disabilities (White, 2004). For this reason, for schools to be active agents in the synergy of learning, they must be open to the outside and have contact with nature, meaning, the architectural space must transcend itself even if this means changing towards a paradigm of education based on humanization processes (Hernández Olguín, 2011).

## 6. FINAL NOTE

Finally, it can be concluded that it is not enough to just satisfy the demand for educational equipment for children with mental disabilities, but it is necessary for each architecture to consider four roles: to become a great physical environment that serves as part of the educational method, facilitate the perception and sensation in children's learning sessions, they must be bioclimatic and biophilic and finally to be an active actor for the synergy of learning. In this way architecture can effectively support the process of educating children and be an educational resource.

Educational architecture, therefore, is not the end but the means to ensure that children with mental disabilities can develop optimally, facilitating their teaching/learning process. It is an educational space that must not only satisfy a functional program, but also the anthroposophic, which is why it is considered that inclusive architecture, especially educational, must consider, at a minimum, the application of *blurring architecture*, the sensory architecture and the biophilic design.

Finally, this research does not mean that the conclusion is exclusive to educational buildings for children with disabilities, but rather shows their greatest need when it comes to special education, especially because the resilience to building adversity that children with disabilities have is lower (Patterson & Blum, 1996).

## KEYNOTES

- 1) The present research work arises in the subject Thesis project of the Faculty of Architecture of the Universidad Privada del Norte.
- 2) The Ministry of Education of Peru names CEBE for special basic education centers and PRITE for early intervention programs, both are types of Peruvian educational equipment.
- 3) Local educational management unit
- 4) Although the object of study is focused on children with mental disabilities, due to the permits granted in educational institutions, only teachers were interviewed. This decision is also pertinent as they are also main actors in the learning process of students and collect the experience of children with mental disabilities.
- 5) As for example estimated in the anthroposophic design of Rudolf Steiner (1961)
- 6) The building cannot be just a palimpsest object of ocularcentrism exposed by Juhani Pallasmaa (2017), but of all the senses.
- 7) Given that educational architecture must be flexible, then, it is possible to affirm that at a minimum its design should consider the application of theories for flexible architecture such as

the one proposed, for example, by Toyo Ito (2006) with his *architecture of fuzzy limits –blurring architecture–*.

8) Which is responsible for the most complex processes of the human brain (Cuervo Martínez & Ávila Matamoros, 2010)

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