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Educational Building in Latin America

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PEB Exchange Programme on Educational Building

FEATURE

Educational building in Latin America

Educational building is receiving more and more attention in Latin America. Public policies in several countries have dedicated additional resources to educational facilities through various programmes and reforms. The following pages include articles describing recent developments in three Latin American countries to expand public education facilities. They are followed by a report on UNESCO's recent seminar on architecture for an inclusive education.

Chile, Brazil and Venezuela have undertaken various efforts related to building new schools. Chile, as part of its educational reform, is designing new learning spaces. In Brazil a new kindergarten network is being developed to meet demand for early childhood education. Similarly, in order to meet the demand for school places, Venezuela is studying construction costs of public schools.

For Latin America and the Caribbean region, UNESCO is working toward the design and use of educational spaces that contribute to reducing inequalities and exclusion.

Mexico, the only Latin American country which is a Member of the OECD, has participated in PEB since 1999, and PEB is looking forward to collaborating with other Latin American countries in the future.

* Mexico is currently the only Latin American country to be a Member of PEB.

Latin America and the Caribbean region at a glance

Population (2000):	516 million
Average annual growth, 1980-2000:	1.8%
Illiteracy rate for ages 15-24 (2000):	6%
Net enrolment in primary education (1997):	91%
Net enrolment in secondary education (1997):	33%
Gross domestic product per capita, average annual real growth:	• 1998-1999: -1.4% • 1999-2000: 2.3%

"The Latin America and the Caribbean region has the highest average per capita income of all developing country regions."

Source: 2001 World Development Indicators, World Bank.

Development of school architecture in Chile

This article presents Chile's educational reform and subsequent investment in infrastructure, the need for a new type of learning spaces and the history of the country's school architecture.

Educational reform and investing in infrastructure

In the 1990s, against the background of educational reform in Chile, the Ministry of Education decided to take a proactive role in investing in infrastructure, linking up and joining forces with other ministries and organisations then in the vanguard of reform in seeking new forms of building to meet curricular and educational innovations.

1990 saw the birth within the Planning and Budget Division of the Infrastructure Unit, now the Department of Infrastructure Investment, offering an approach that united the isolated efforts of each of the ministries and institutions. It paved the way for collaboration in training interdisciplinary and inter-institutional technical teams at different levels of action, both national and regional. It also allowed for the participation of all the bodies and players involved in the process, defining a specific role for each yet, at the same time, a concerted role in achieving an infrastructure to deliver quality education.

The first steps in this new approach were targeted at better management, financing and quality by involving the educational community in formulating and prioritising needs, followed by dialogue with the architects. As to financing, all ministerial programmes included an infrastructure component to ensure the minimum conditions necessary for the educational reform they introduced. Then in 1994, the Educational Infrastructure Fund was set up and transferred to the regional governments so as to contribute to improving the installed capacity in the education service in different regions of the country. In addition, in 1998, an annual maintenance support subsidy was created, as well as a new source of funding, the additional capital support cost subsidy. This subsidy serves to finance the expansion needed in the education service to implement the full-time education scheme, the educational reform policy with the greatest impact on the education system.

The educational reform process and the heavy investment in infrastructure in the 1990s created unique conditions to reconsider space in terms of educational requirements and the decentralisation of the country. This resulted in a careful examination of investment needed to respond effectively in enhancing the quality of the educational service and introduce the changes needed to meet the new educational demands and reduce the deficiencies that had dragged on for years.

Chemistry and physics laboratory
at the Abelardo Nunez School, circa 1950
(National History Museum Collection, Chile)

Against this background, and to support educational reforms, in 1997, the joint Ministry of Education/UNESCO project was launched on "Chilean educational reform: optimisation of investment in education infrastructure". The aim of this project, which is now in progress, was to develop methods and instruments to strengthen regional technical teams: guidance on design of school buildings, pre-school, primary and secondary, furnishings, maintenance manuals, training seminars and workshops, national architecture competitions and dissemination of results, studies and publications under the new educational principles based on the project objectives. The project has become a forum for dialogue between architects, educators, universities, researchers and other national ministries and organisations, co-ordinated by the architects Jadille Baza on the national side and Rodolfo Almeida on the international side.

A new type of learning spaces

Learning spaces need changes to bring them in line with educational innovations and the extended social function of education, expressed in openness to the community and using primary and secondary schools as part of the public domain.

The shift from homogeneous education to diversified education replaces the classroom conceived as a formal layout for presentations from the front by the teacher with a flexible and dynamic space which facilitates interaction

and multiple use. The school is no longer centred only on the classroom: now there are learning resource centres, multimedia centres, computer rooms and meeting rooms, each adding their bit to the overall educational space. It is a motivating space, incorporating technology and artistic and cultural expression as part of the educational premises, with colourful recreational areas for games and outdoor areas designed for greater interaction and contact with the environment.

Implementing these ideas needs educational architecture that strengthens the dialogue between educators and architects, an architecture that satisfies the educational programme of each establishment and the social, economic and cultural reality of the community to which it belongs, speaking the language of the place and respecting the natural environment surrounding it.

History of Chile's school architecture

Chile's school architecture has followed a dynamic and varied path, changing with the times and reflecting the trends of different periods of building. During the colonial period, municipalities and the church provided premises for education which at that time did not amount to much and did not last long, because people had little interest. Later, renting of premises for primary schools took up a good proportion of the budget in the 19th century, but even then, schools worked in "dark, cramped, stuffy, dirty and unprotected" premises. In towns and in the country, schools were set up in ill-equipped shacks, and in all of Chile there were still at most 20 formal school properties.

Only towards the end of the 19th century, when teaching became more systematic and demand increased, did the need for architecture specifically for education begin to make itself felt. It was the time when, due to a more formal kind of teaching, greater importance was attached to the classroom. Buildings thus took the form of a collection of classrooms and the concerns focused on improving ventilation and lighting.

Moving from the 19th to the early 20th century, the schools built under the administrations of Presidents Montt, Balmaceda, Barros Luco and Sanfuentes stand out. However, it was after 1920 that eyes began to turn beyond the classroom to consider the establishment as a whole. In the mid-thirties, the idea spread of a technical body specialising in school buildings, which would alleviate the shortage of schools and increase the coverage of formal education.

In January 1937, the Schools Construction Company (*Sociedad Constructora de Establecimientos Educacionales,* SCEE) was founded, a body which for 50 years tackled the shortage of school buildings in the country. That shortage, according to a report of the time, meant that of 896 000 children aged from seven to 15, only 510 000 were in school and the rest, more than 40%, were not getting any education, either because there were not enough school places or because there were simply no schools at all in many parts of the country.

La Salida Agricultural Centre, circa 1927
(National History Museum Collection, Chile)

During a first phase, until about 1950, the Construction Company and the Ministry of Public Works responded to the challenge, with functional architecture adapted to each situation, albeit with a certain monumentalism in the fashion of the time. In the 1960s, however, to meet demand, population movements and new towns, the individual approach was exchanged for a mass school building plan based on a standard system, using prefabricated constructions, which spread to almost all school building.

Since 1959, responsibility for state school building was concentrated in the hands of the Construction Company, the national body intended to ensure appropriate and rational provision in the country of buildings for formal education. This institution covered research, design, planning and construction of educational infrastructure. As increased coverage was the priority of educational policy in the 1960s, the main effort was directed at mass construction of schools, 1967 standing out as the year when the greatest area was constructed, 202 328 m² on 277 sites. In 1971, while schools were being built in new towns, 257 buses taken from the public transport system were converted into mobile classrooms, while at the same time emergency classrooms were introduced, using prefabricated wooden units, originally intended for earthquake response, that were quick and cheap to build.

The SCEE ceased operations in 1987, due to the process in Chile of decentralisation, regionalisation and the transfer of educational establishments to the municipalities. At

that time, the Ministries of the Interior, Planning and Co-operation and Finance were responsible for that process. The Department of Architecture in the Ministry of Public Works functioned as a technical unit in school building.

Colegio Buen Pastor
(College of the Good Shepherd), Copiapó, Chile

Reference:

Baza, J. (1999), "Apuntes sobre la Evolución de la Arquitectura Escolar en Chile", in *Nuevos Espacios Educativos*, MINEDUC/UNESCO.

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Kindergarten network in Brazil

In 1992 when Mauá City in Greater São Paulo asked an architecture and planning firm to develop its kindergarten network, less than 20% of the demand for early childhood education was being met. Children aged four to six were in school for little more than three hours a day, during one of three shifts: morning, midday or evening. This schooling included basic education provided by the government as well as non-governmental organisation schools and church schools.

Background

Since the 1970s, São Paulo State has made intense efforts to expand the network of state schools providing basic education (for seven- to 14-year-olds) and has built about 4 000 schools, most of them designed individually by architects. This construction was in response to population growth: the population of Greater São Paulo has multiplied fourfold in barely 50 years to reach today's figure of 16 million people.

Although the school network grew, the quality of education was not maintained, let alone improved. State schools today, although much better equipped in terms of premises, have not been very successful, especially in the poorest regions.

The majority of children in deprived areas fail to achieve in school. Parents who are out at work all day, getting up early and returning late at night, do not talk much with their children, who as a result do not learn to speak or communicate properly. The children have a very limited vocabulary and cannot express themselves coherently. Given this scenario, it is understandable why at the age of seven the children have difficulty reading and writing and are unable to think abstractly. These weaknesses lead to serious problems such as frequently repeating classes or abandoning school because of repeated failure, and they lead to the need to increase the number of places because children do not complete their courses in the allotted period.

Planning

To reverse this situation, the Secretary of Education of São Paulo State drew up the Basic Education Reform Programme with a credit line from the International Bank for Reconstruction and Development (IBRD), which agreed to finance 80% of the cost of construction of kindergartens in areas where family income was less than USD 300.

The Rabbit kindergarten

The Monkey kindergarten

At Mauá City's request, Teuba Architecture and Planning designed and planned a kindergarten network based on the government's urban survey, identifying sectors and districts where low-income families live. They selected 24 sites and prepared a preliminary architectural study for each. The planned schools would satisfy 90% of the demand in those areas.

The preliminary school design included four to six classrooms, restrooms, a kitchen, a food store, administrative areas, service areas and a large covered area for various activities. Outside there would be a courtyard, playground and garden.

To ensure that these buildings could be identified as a homogeneous group, Teuba established certain criteria for the project:

- building height limited to one or two floors;
- a layout that allows children to see throughout the school and thus have a sense of the area as a whole;
- use of a separate reinforced concrete structure;
- clay tiled roofs;
- exposed laminated brick walls;
- restrooms located under water towers;
- maximum height under windows 60 cm to allow children to see out;
- lockers under windows in teaching and administrative areas.

To distinguish each school, Teuba proposed to name them after different animals, and each would bear a ceramic panel representing their animal.

Outcome

Seventeen schools were approved for construction, and the city increased its contribution toward the cost, originally 20%, in order to serve more families. Because those involved realised the programme's importance for the children's success in primary school, it was decided to build schools with six classrooms wherever the site allowed, in spite of the fact that the IBRD had asked for a reduction to four classrooms in some cases.

Three architectural firms collaborated with Teuba to develop the plans for these schools, based on the criteria previously established.

During construction, the opposition won the municipal elections, which slowed down the programme. Seventeen plans were prepared, but only 11 schools have been built. To break the schools' link with the previous government, the animal panels were cancelled, the open concrete structure was painted, some fences were replaced by brick walls and two schools were modified to take in children under four years old. The furniture, originally designed in wood, was executed in metal, unfortunately making it much heavier.

Despite these setbacks, over 5 000 children are learning in these schools and their parents are also benefiting. In the new kindergartens, children between the ages of four and six years encounter factors that contribute to their chances of success in primary school. They can improve their communication skills and develop abstract reasoning, as well as develop their social skills through interaction with their teachers and other children. They exercise, learn personal hygiene and are well fed. Many parents attend evening classes offered by the schools.

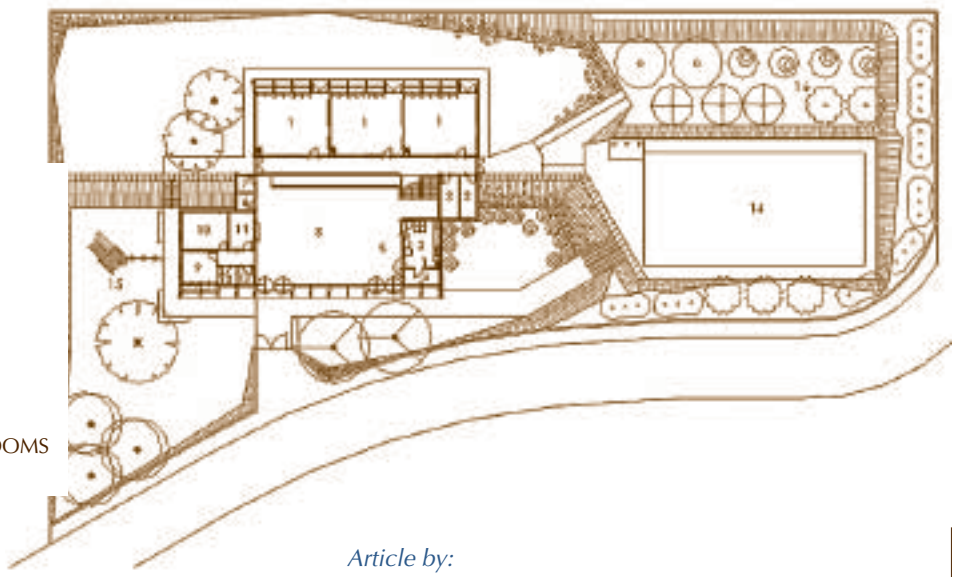
The Rhinoceros kindergarten as originally planned

Elevation

Site plan

KEY TO PLAN

1. CLASSROOM
2. CHILDREN'S RESTROOMS
3. KITCHEN
4. FOOD STORE
5. CANTEEN
6. CLEANING MATERIALS
7. STAFF RESTROOMS
8. COVERED PLAYGROUND
9. ADMINISTRATION
10. TEACHERS' AREA
11. MULTIPURPOSE AREA
12. STORE
13. ADMINISTRATION RESTROOMS
14. MINI COURTYARD
15. PLAYGROUND
16. ORCHARD



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The Lizard kindergarten

The Armadillo kindergarten

Construction costs of public schools in Venezuela

Venezuela at a glance

Total area: 912 050 km^2

Population: 24.2 million

Population under 18: 9 660 000*

**Source*: UNICEF.

Like many other countries, Venezuela urgently needs to develop strategic school building plans to meet the demand for school places, while obtaining maximum value for money. To this end, the body responsible for school building programmes, FEDE,[1] contracted a study of costs and their relation to building quality to improve the accuracy of estimates of investment in national school building plans. This article describes the methodology used and presents the study's conclusions.

Methodology

The research method was based on a series of hypotheses that were tested to prove or reject the relationship between the cost of construction and four variables representative of the concept of "quality in school building". The variables used are the structural system (concrete, metal or mixed), durability, programmatic standards and functional standards.

The study took a sample of 2% of schools built throughout the country in the period from 1985 to 2000 (40 schools). Information from two sources was examined:

- surveys on each school site, which provided data for calculating the values for durability, programmatic indicators and functional indicators;
- construction completion reports, which provided information on the actual costs of construction.

The data was processed and analysed to determine the main cost trends by type of school and construction firm.

The hypotheses were tested, using the data obtained, to determine the correlation between variables.[2] Findings are summarised in the table below. Net cost includes internal and other covered areas, and gross cost includes covered and external areas.

A Venezuelan kindergarten with a concrete structure

A Venezuelan kindergarten with a concrete and metal structure

Hypothesis	Dependent variables	Relationship *(Costs: net and gross)*	Independent variables *(Quality)*
1	Net cost of investment	is equivalent in	analogous structural systems.
2	Gross cost of investment	is not equivalent in	
3	Net cost of investment	is proportional to	durability, "projection of useful life of materials used".
4			compliance with functional standards.
5			compliance with programmatic standards.

1. Foundation for educational buildings and grants (*Fundación de Edificaciones y Dotaciones Educativas*), under the Ministry of Education, Culture and Sport.

2. The Pearson coefficient of correlation r was calculated for this purpose, giving values in the range –1 to +1, indicating the existence and direction of relationships between the variables (direct or inverse), or the absence of relationship when the coefficient is equal to zero.

Conclusions

Hypotheses 1 and 2: Relationship between cost and the structural system

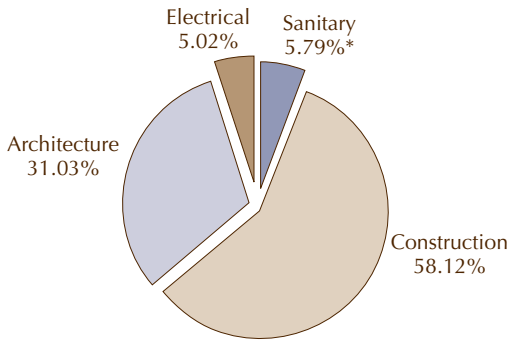
As shown in the following table, the net cost (covered area) is relatively stable in analogous structural systems, while the gross cost (covered area + external areas) increases with the quantity and quality of construction of the external areas.

Costs by structural system (USD per m^2)

System	*Net cost*	*Gross cost*
Concrete	438	645
Mixed	357	544
Metal	323	409

The percentage breakdown of the net cost by construction component is as follows:

Breakdown of investment (net cost) as mean percentage by component



* Varies between 4% and 5.79% as a function of the construction cost component.

Hypothesis 3: Relationship between cost and durability

Both factors, net cost and gross cost, increase as a function of the projected useful life of the materials used in construction, which confirms the validity of the results obtained for hypotheses 1 and 2.

Hypothesis 4: Relationship between cost and compliance with functional standards

Both net and gross costs increase as a function of compliance with functional standards, *i.e.* maintenance of comfort and safety indexes, which include the optimal ratio between the number of students enrolled and the number of restrooms, lighting and ventilation indexes, percentages of circulation areas in line with safety standards, and floorings and surfaces offering maximum hygiene and safety.

Though meeting these standards increases the school's cost, it decreases the building's vulnerability and, above all, guarantees a high level of comfort for teachers and students.

Hypothesis 5: Relationship between cost and compliance with programmatic standards

This relationship was evaluated by verifying the existence and size of general and special classrooms (for music, pottery and computers), workshops, laboratories, libraries, sports grounds, recreational areas, and administrative and service areas such as offices, archives and maintenance. For the present study, the net cost is not affected by compliance with programmatic and spatial standards, but this is not a reason to exclude this factor. On the contrary, given its importance in terms of educational aims, it should be the subject of separate research.

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Educational architecture for an education without exclusion

The "III Regional Seminar on Educational Spaces in Mexico and in Latin America and the Caribbean" was held in the City of Veracruz, Mexico, from 23 to 27 October 2001, for institutions from the region and Europe concerned with educational spaces. The seminar was organised by Juan Maldonado Pereda, Secretary of Education and Culture of the Government of the State of Veracruz, UNESCO's Regional Office for Education for Latin America and the Caribbean, the International Centre of Prospective and Higher Studies (CIPAE) and the Educational Spaces Construction Committee of the State of Veracruz (CCEE).

The central theme of the seminar was a thorough analysis of educational reforms undertaken by the countries of the region and the proposal for architectural competency to design and construct spaces leading to "lifelong education" embodied in an "education without exclusion". UNESCO,

engaged in discourse with governments throughout the world and the best minds, constantly invites all societies and their organisations to develop and put into practice policies of educational inclusion for all people, in order to live together in peace throughout the 21st century.

UNESCO defines education as an individual and social process of learning to be, learning to learn, learning to produce and learning to live together, from which no one should be excluded or accept exclusion.[1]

The seminar in Veracruz builds upon the Santiago Declaration, which resulted from the "II Seminar on Educational Spaces in Chile and in Latin America and the Caribbean" (Santiago, November 2000). The declaration underlines that "the spaces where educational processes take place play now-a-days a decisive role, because they affect the personal and social relation system." Therefore, architecture for education becomes a high-impact instrument of education.

The seminar discussions permitted a fruitful exchange of experiences on the topics of the three working groups:

- formulation of educational policies that link architectural spaces to current advances in information technology and various agents and educational services;
- design of new spaces demanded by educational reforms conducive to an education without exclusion, with community participation and respect for local cultures and environment;
- implementation of public policies on design, construction, maintenance and utilisation of educational spaces to meet the requirements set by educational reforms towards education without exclusion.

UNESCO proposed the immediate creation of a Regional Project on Educational Spaces. It offered technical support and an initial amount of USD 30 000 as seed-funds which no doubt will attract other financial contributions.

Seminar participants included renowned architects, engineers, educators, educational planners, researchers, construction companies and high government officials such as ministers and secretaries of education. The region was widely represented with almost 50 participants coming from some 30 countries, and about 300 participants represented Mexico (from CAPFCE, Educational Spaces Construction Units at state level, faculties of architecture, etc.). The OECD Programme on Educational Building also participated.

Of particular relevance was the presence of Vassilis Sgoutas, President of the International Union of Architects (UIA), who made a key presentation on "Architecture without architectural exclusions – understanding architecture in the present-day context".

Conclusions

The seminar concluded with the Xalapa Declaration. Some of the 17 declarations and recommendations it contains are presented below.

Declarations:

- The main objective is to reduce exclusion in each of the countries of the region.
- The inequalities existing in the world today and, above all, the social segregation of space must be reduced at all cost.
- Educational spaces should become elements of community integration; social participation, environmental and ethical values bring about a sense of belonging and identity from which nobody is excluded or feels excluded.
- The current decentralisation processes of national bodies responsible for physical infrastructure should not isolate them from each other nor from central education; rather it should stimulate them to set up internal information networks on educational spaces, which in turn should be in contact with similar networks in other countries of the region, through UNESCO and CIPAE.
- Participants are satisfied with and enthusiastic about UNESCO's proposal to establish a Regional Project on Educational Spaces.
- Participants strongly back the proposal of the Secretary of Education and Culture to declare the Veracruz Historical Centre as a National Heritage Site.

Recommendations:

- UNESCO's Regional Office should formulate the content and programme of the proposed Regional Project on Educational Spaces.
- The governments of the participants should join the proposal of the Regional Project and exhort their authorities to contribute funds.
- The links among national and international bodies (UIA, OECD, CIPAE) should be strengthened.
- The declarations and recommendations from this seminar should be made widely known to be used as a tool to give birth to a culture of education without exclusions.

The final report of the seminar is under preparation in Spanish and English.

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1. These definitions comes from UNESCO meetings, particularly those held in Jomtien, Thailand, in 1990 on "Education for All", in Hamburg, Germany, in 1997 on "Life Long Education" and recently in Cochabamba, Bolivia, in 2001 on the "Principal Project".