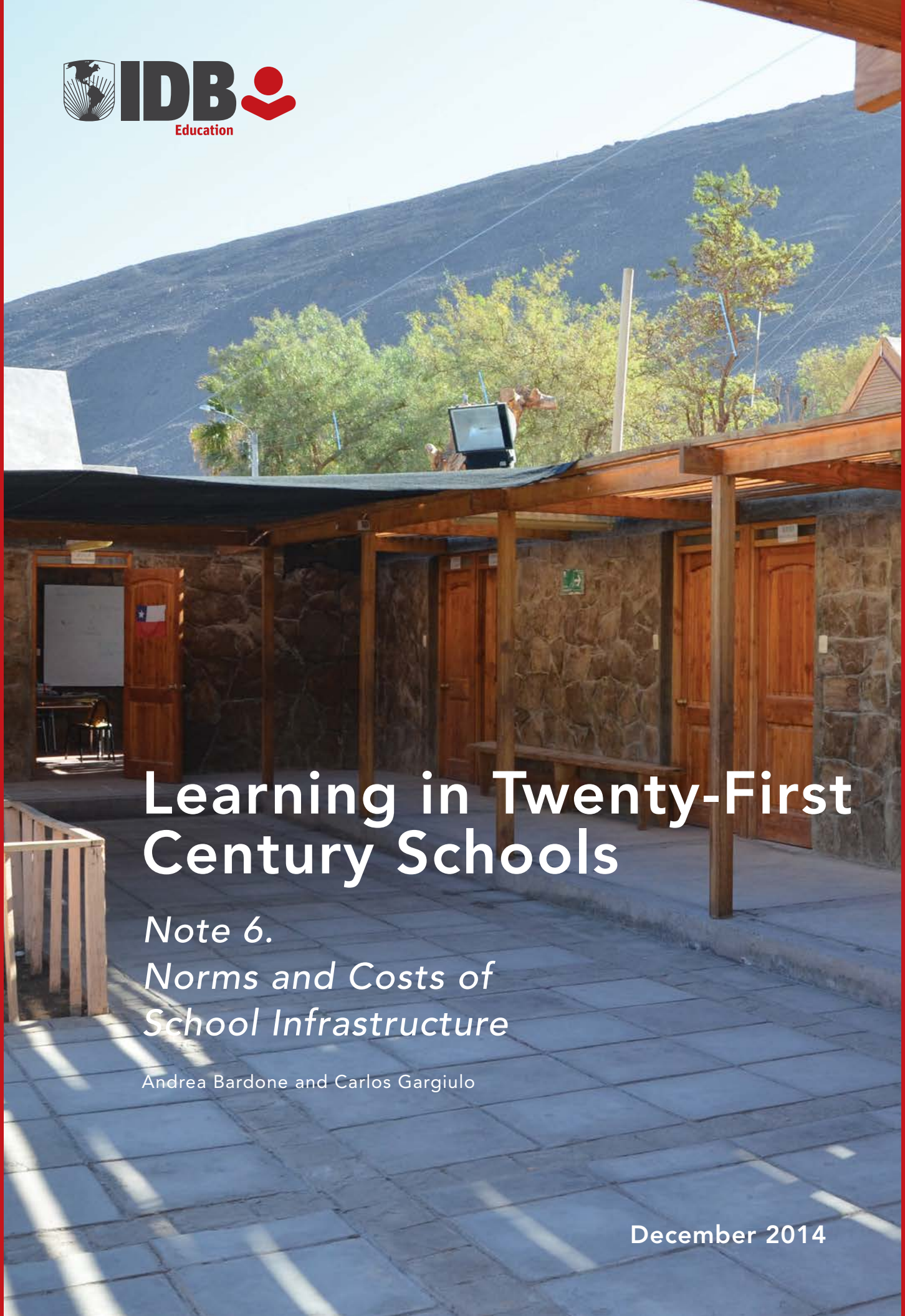

IDB Education

Learning in Twenty-First Century Schools

Note 6. Norms and Costs of School Infrastructure

Andrea Bardone and Carlos Gargiulo

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Norms and Costs of School Infrastructure

Introduction

As a general rule, regional educational systems have dissimilar school building patterns, with many dating back to the 19th century, or buildings that have responded to various architectural, pedagogical, as well as political currents and that have been adapted more or less successfully to today's requirements. At the same time, investment in recent years has favored the emergence of modern buildings with greater comfort levels, better suited to changes in teaching and learning processes, including the use of technology and computing, accessibility, and community participation.

This context has led to regional discussions, analyses, and statements of physical and environmental conditions over the comfort levels schools should enjoy in order to provide a more appropriate, stimulating, safe, sustainable, and healthy environment with a view to improving student performance and retention and reduce violence among students.

Regulations and standards affecting educational spaces and their respective dimensions and construction costs were collected from countries around the region[1] to allow for a comparison between standards in each country and those in more developed countries. This will allow for analyses of these regulations in light of advances in teaching, technological changes, the response to climate change, and energy conservation. In future, an information repository could be created that could be updated periodically with up-to-date information on changes in these standards and regulations.

This information is expected to lead to a better understanding of the regional picture, progress in resolving design problems, and the creation of educational spaces. The organization and grouping of the schools' functional units was discussed and agreed upon by all countries in order for them to report on the same organizational scheme.

The schools' architectural program was analyzed using the concept of "process," understood as "a set of interrelated activities that transform input elements in interaction and turn them into results."[2] Processes were grouped as either central or supporting processes. The former refer to pedagogical and curricular

1. The signatory countries to this first phase were (in alphabetical order): Argentina, Barbados, Chile, Colombia, Costa Rica, Dominican Republic, Guatemala, Honduras, Jamaica, Mexico, Paraguay, and Trinidad and Tobago. Only ten participated in the regulations and standards matrix since Paraguay and Trinidad and Tobago did not send the information.

2. James A. Finch Stoner et al. 1996. *Administración*. Mexico City: Pearson Education.

processes, while the latter include ancillary and complementary services, supply and processing, and management and administration. At the same time, each process was divided according to function and then by space. Therefore, the central or pedagogical and curricular process was divided by function into: (i) general education; (ii) science and technology; (iii) learning resources; and (iv) arts. These functions correspond to the following spaces: classrooms, labs, learning resource centers, and workshops, respectively. These spaces were then subdivided into functional or local units: the classroom, science lab, multimedia and computer labs, and the music and arts rooms for the workshops (Table 1).

This arrangement was used to design a matrix into which to transfer data extracted from current guidelines, laws, and regulations for the design and construction of schools in the countries involved. The model thus developed was completed by the Technical Team[3] in a series of workshops. To achieve uniformity of criteria and obtain comparable data, it was agreed that the incoming data would come from elementary schools with no fewer than 12 classrooms and no more than 5 grade levels, which turned out to be the most widespread model, which moreover coincided with the age at which students take the PISA (Program for International Student Assessment) test.

This last point would be later linked to the decision to conduct an environmental audit in schools with similar characteristics as those in the matrix and set the efficiency level (or otherwise) of the physical building as well as orientation, energy consumption, and the users' assessment of the comfort level. For the purpose of this summary, we will analyze the most representative aspects, namely the environment, the buildings themselves, and the main pedagogical processes.

3. The technical team consisted of a representative from each country involved in the CT-BPR.

Findings and analysis

The first hypothesis refers to the existence (or lack) of mandatory standards for all criteria generated by the matrix.

This report highlights the fact that demand for regulations governing fire, earthquakes, hurricanes, equipment, and accessibility are supported in most cases by laws and regulations that extend to all buildings and not only to schools and referred to in the recommendations made concerning them by the ministries of education or the authority responsible for infrastructure. Argentina, Chile, Colombia, Costa Rica, and the Dominican Republic recorded information on mandatory compliance. The other countries in the group did not record such information.

Among the mandatory requirements, we began with those related to the safety features affecting the immediate surroundings of the school buildings, namely the minimum land size required, a risk assessment of the environment (topography, orientation, and proximity to industries and highways), the prevention of natural disasters (earthquakes, landslides, and floods), and accessibility. In terms of the school buildings themselves, we researched safety standards for fire and accident safety, construction systems, recommended maximum heights, means of evacuation in emergencies, and internal access (ramps, elevators, etc.).

We then recorded the presence (or lack) of functional units, with each country reviewing its model school and collating current regulations in order to verify the existence of criteria or recommendations for each component as well as the issuing authority. We further recorded the total area of each building, area per student, recommended conditions for heat, lighting, and acoustic comfort, and air recycling per hour.

All countries recorded information in this section of the matrix, and differences were found, which are discussed below. An initial reading of what was recorded under central pedagogical processes shows the composition of elementary schools in the participating

TABLE 1.
Analysis matrix—functional classification units

Process		Function	Space	Functional/local unit
Central	Pedagógicos/curriculares	General education	Classroom	Classroom
		Science and technology	Labs	Science lab
				Multimedia lab
				Computer lab
		Learning resources	Learning resource center	Computer space
				Library
		arts	Workshops	Music room
				Arts room
Support	Ancillary services	Physical education	Sports	Open sports space
				Enclosed sports space
			Recreational activities	Open areas
				Enclosed areas
				Galleries and hallways
				Landscaped gardens
		Community activities and meetings	Community and extracurricular activities	Multi-purpose room
				Theater workshop
				Multipurpose workshop
		Psycho-physical health	School psychology	School psychology office
			Medical care	First-aid room
		Remedial classes	Remedial space	Small classrooms (10 students)
Support activities	Complementary	Information security	Control of access to information	Entrance hall
			Accommodation	Janitor's residence
		Risk management	Outdoor spaces	Enclosure
		Communication	Telephone	Telephone system
			Information systems	Server room
		Transportation	Parking lot	Covered/open-air parking
			Book and computer transportation	Parking
		Hygiene	Personal hygiene	Cleaning and storage room
		Comfort	Public waiting	Public waiting area
			Sanitary services	Faculty and staff restrooms
				Visitors' restrooms
				Students' restrooms
				Disabled access restrooms
				Personal hygiene catering service
				Personal hygiene general assistance
			Faculty meetings	Faculty lounge
			Teaching assistants	Teaching assistants' lounge
			Student meetings	Student center
			Lunch/dinner	Dining hall
			Drink and snack vending	Kiosk
				Cafeteria
		Maintenance	Repairs	Maintenance workshop
			Control	Machine room

(continued)

TABLE 1.
Continued

Process		Function	Space	Functional/local unit
Support activities	Supply and processing	Storage	Food	Storage room
			General storage	Storage room
			School supplies	Storage room
			Water	Extractors
				Water tanks and cisterns
				Drinking fountains
			Gas/fuel	Storage room
			Energy	Generators
				Battery storage
			Waste treatment	Waste treatment plant or septic tank
			Waste disposal	General garbage container storage
				Recycling container storage
		Processing	Catering	Kitchen
				Faculty lunchroom
	Administration and management	Management	Offices	Principal's office
				Deputy principal's office
				Secretary
		Administration	Administrative spaces	Administrative office

countries. Studies have linked the academic results of students at elementary level to the presence of a library, computer rooms, science labs, arts rooms, and music rooms, indicating a positive relationship between these resources within the school and 2006 SERCE test results. It is therefore relevant to recommend making these spaces a requirement in the rules and standards applying to participating countries (Table 2).

Thus, excluding the classroom, which will be studied in its own special section, nine of the ten countries included a library among mandatory physical resources for elementary education. The next most important functional unit was the computer lab, chosen by seven of the ten countries. If we include the multimedia lab as a resource that facilitates activities related to Information and Communication Technologies (ICT) in the cases of Argentina and Chile, the number of countries rises to nine. It is worth noting that both Honduras and Jamaica require both functional units. As for Colombia, because of decisions arising from its educational model, this list includes a non-exclusive lab, which is shared with the secondary level, this site was not counted as multi-purpose labs of this type deal with subjects such as biology, physics, and chemistry depending on grade level. The space identified as computer space was not selected by any of the countries perhaps because it is considered an obsolete resource given innovations such as Wi-Fi, laptops, and tablets, which have been brought into education.

Science labs were selected by five countries, while music and arts rooms were chosen by only two countries, namely Barbados and Argentina, with the latter not requiring this in an exclusionary manner since for all practical purposes, both activities are carried out in multi-purpose rooms, which turns out to be the more common solution. Table 2 shows choices by country.

TABLE 2.
Pedagogical and curricular functional units

	Argentina	Barbados	Chile	Colombia	Costa Rica	Guatemala	Honduras	Jamaica	Mexico	Dominican Republic
Classrooms	*	*	*	*	*	*	*	*	*	*
Science labs	*	*				*	*	*		
Multimedia labs	*		*				*	*		
Computer labs		*			*	*	*	*	*	*
Computer spaces										
Library	*	*	*	*		*	*	*	*	*
Music rooms	*	*								
Arts rooms	*	*								

With regard to classrooms, this chapter discusses two aspects: number of students per classroom, and surface area per student.

There has been much debate regarding the correlation between classroom size and occupation and student performance. On the one hand, research such as STAR[4] shows best results on standardized math and reading tests in classes ranging from 13 to 17 students compared to those ranging from 22 and 25 students, while interviews with teachers of smaller groups also point to improvements in the quality of teaching and the use of learning resources by teachers.[5] On the other hand, Finland and its well-known achievements on PISA studies in 2000 and 2003 is among the countries with fewer students per classroom (the rule being that class size cannot exceed 25 students, although there are normally fewer than 20 per classroom), reinforced by generous surface area per student, which in the case of the new school building in Joensuu,[6] which uses about 65 m² per classroom. Additional data are provided by social organizations such as Class Size Matters,[7] which advocates a reduction in number of students per classroom in New York City and cites numerous studies and examples of regulations in other US states.

Core area and cultural educational processes

This area of the school includes the most important functional spaces required for learning, namely classrooms, labs (science and computer), learning resources (library), and arts and music rooms (See tables 1 and 2).

An analysis of the matrix shows that no participating country has classrooms with fewer than 30 students, clearly a high number in the light of the

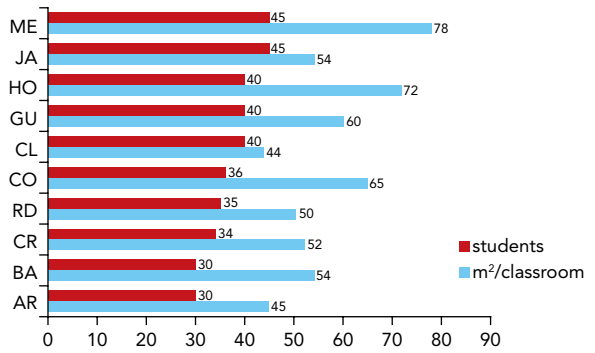
4. Tennessee's Student Teacher Achievement Ratio (STAR) experiment. Krueger, Alan B. and Diane M. Whitmore. 2001. "The Effect of Attending a Small Class in the Early Grades on College Test-Taking and Middle School Test Results: Evidence from Project STAR." *Economic Journal*, 111, 1–28; Mosteller, Frederick. 1995. "The Tennessee Study of Class Size in the Early School Grades. *The Future of Children*, 2, 113–27.

5. Diane Whitmore Schanzenbach. 2014. *Does Class Size Matter?* Northwestern University National Education Policy Center School of Education, University of Colorado at Boulder (February).

6. Joensuu, referenced by Paul Robert. 2006. "*L'éducation en Finlande: Les secrets d'une étonnante réussite*".

7. Available from: http://www.classsizematters.org.

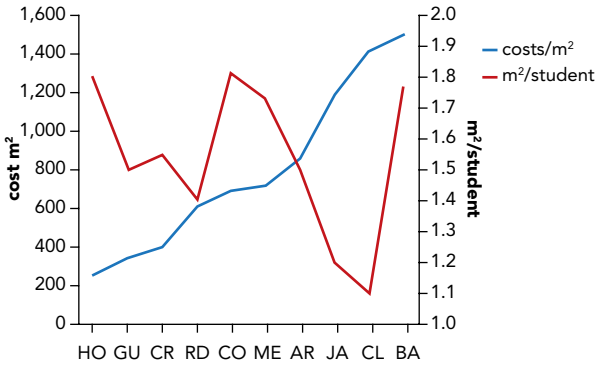
FIGURE 1.
Surface area per classroom (in m2) and number of students per classroom



recommendations above. Argentina and Barbados both recommend this amount as a maximum, even though the surface area per student is 1.5 m² per student in a 45-m² classroom, and 1.77 m² per student in a 54-m² classroom, respectively, in addition to the aim of increasing comfort and providing options for different arrangements of equipment or work group dynamics in the case of Barbados. In the next group are Costa Rica, the Dominican Republic, and Colombia, with 34, 35, and 36 students per classroom, respectively, with classroom size varying between 52 m², 50 m², and 65 m² per classroom, respectively (See Figure 3).

A group of three countries (Chile, Guatemala, and Honduras) recorded about 40 students per classroom.

FIGURE 2.
Costs per m² (in US$) vs. surface area (in m²) per student



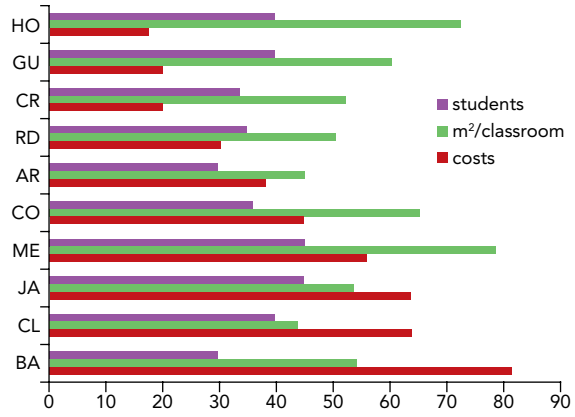
As regards surface area, Chile is the country with the least surface area per classroom, with 44 m², while Guatemala records 60 m² and Honduras 72 m² for the same number of students.

Finally, we have Jamaica and Mexico, with 45 students per classroom, or just 1.2 m² per student, and a surface area of 54 m² per classroom in Jamaica, compared to a generous 78 m² per classroom for the same number of students in Mexico.

In Figure 2, the countries are sorted by order of increasing cost per square meter of classroom space, with Honduras, Guatemala, and Costa Rica showing lower unit costs. Jointly with the Dominican Republic, Colombia, and Mexico, these countries register below average costs (US$795/m²), with Argentina showing average costs, followed by Jamaica, Chile, and Barbados, all of which show unit costs exceeding US$1,200/m². In terms of surface area per student, while trending opposite to costs, the correlation coefficient is only R^2 = - 0.39, due to three outliers; Colombia, Barbados, and Mexico, which have high m²/student ratios relative to their construction costs. The highest surface area per student is around 1.80 m² in Colombia, Honduras, Barbados and Mexico. This is followed by Guatemala, Costa Rica, and Argentina, which come in close to the average (1.54 m² per student). Countries with the least surface area per student are Jamaica and Chile, with 1.2 and 1.1 m² per student, respectively. This can lead to classrooms where the main teaching approach is teacher-fronted, with little chance for group work and little or no addition of teaching materials or generation of dynamic teaching processes.

Figure 3 shows costs per classroom for the various countries in increasing order expressed in thousands of dollars. Honduras has the lowest cost per classroom despite these being among the most spacious. However, the standard of finish is lower than in other countries. It may therefore be justified to recommend smaller classroom sizes combined with higher quality construction. At the other extreme is Barbados, with the highest cost per classroom and the fewest students in them. In this case, the recommendation

FIGURE 3.
Cost of one classroom in US$ (thousands)



would be to seek lower construction costs or to reduce classroom sizes in order to reach values closer to the average (1.54 m² per student). Chile and Jamaica also show relatively high construction costs accompanied by lower surface area per student.

Support areas: ancillary services

As shown in Table 1, support services include the areas of ancillary services, complementary services, supplying and tracking, and management and administration.

We now analyze the functional units that make up the support processes in the ancillary services section, which refers to spaces consisting of the following educational venues:

- Open and enclosed sports fields;
- Open and enclosed areas, galleries, hallways, and gardens;
- Multi-purpose rooms, theater workshops, and multi-purpose workshops;
- School psychologist's office;
- First-aid room; and
- Remedial classrooms

As regards physical education, whose functions include sports and recreation, it is notable that an outside sports field is an invariable requirement for eight of the ten countries, and an enclosed sports field a requirement in only two countries (Costa Rica and Guatemala). Only Argentina has none of these two types of spaces. To a great extent, this is because the multi-purpose space doubles as a basketball or volleyball court. It is important to mention that the high cost of these premises, which are due to their dimensions, encourages an appropriate schedule of activities, allowing for a high rotation and continuous use of space.

Recreational activities, which are covered by multiple formats in all countries, are included within physical education. Open courtyards were selected by eight countries, with the exception of Barbados and Colombia, which nonetheless choose gardens and landscaped areas, the latter item being selected by seven of the ten countries. Covered courtyards are chosen by three countries (Barbados, Chile, and Jamaica), while galleries and hallways are chosen by five (Argentina, Barbados, Colombia, Costa Rica, and Honduras).

Within the community function, we find spaces for community and extracurricular activities, including functional and site units, multi-purpose spaces, theater workshops, and multi-purpose workshops. Only Costa Rica considers none of the aforementioned premises as a requirement. The more widely chosen option is the multi-purpose room, partly (as previously explained) because of its flexibility and possibilities for use (which are not required by Chile or Costa Rica). The multi-purpose workshop was selected by four countries (Argentina, Chile, Honduras, and Jamaica), and its usefulness focuses on extracurricular activities implemented at the elementary level. The theater workshop was not chosen as an exclusive space by any of the countries.

Turning to spaces devoted to mental and physical health, the school psychologist's office is favored by six countries, while the first-aid and healthcare room garnered four, with only Colombia and Jamaica requiring both, and Barbados and Mexico requiring none.

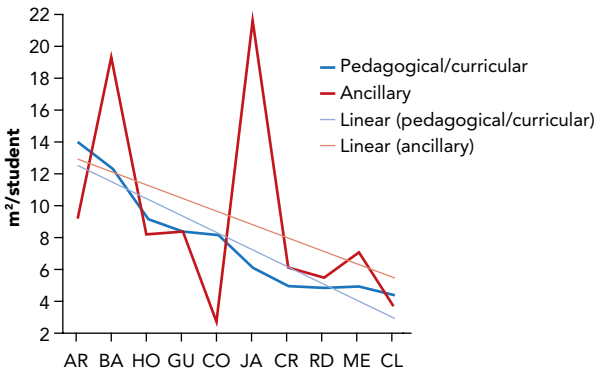
As regards remedial spaces used as small classrooms for small groups, whether for lagging students or to provide accelerated classes, this was chosen by Barbados only, even though other countries such as Costa Rica have a program to support small groups after school hours.

In conclusion, we observe varying levels of interest in participating countries for open spaces for sports or recreational activities. Those countries, which have more benign climates, offer very large surface areas, a welcome surprise if we bear in mind the importance to both health and social relationships in general of these activities. It is also notable that despite having small territorial space, the islands of Barbados and Jamaica have larger open surfaces.

The surface area in square meters per student for curricular and pedagogical purposes (classrooms, labs, library, and music and arts rooms) averages 7.77 m² per student, with the average for the ten countries in the areas of ancillary services referred to above being a little higher, at 9.22 m² per student. Figure 4 shows the countries surveyed in decreasing sequence in terms of pedagogical and curriculum processes.

There are clearly two peaks in the representation of ancillary services, the highest for Jamaica, and the second for Barbados. Colombia is the country with the smallest surface area dedicated to ancillary services. This may be due to the fact that the country opted to combine elementary and secondary education within the same schools, which makes it very difficult to separate surface areas by grade level.

FIGURE 4.
Surface area per student for pedagogical and curricular vs. ancillary services



The reason why Argentina devotes more surface area per student to pedagogical spaces is that it requires science and multimedia labs as well as more libraries, music rooms, and art rooms. At the lower end of surface area per student dedicated to pedagogical processes are Colombia, Costa Rica, the Dominican Republic, and Chile, the latter having multimedia labs and libraries accommodating 40 students per classroom versus Argentina's 30. Meanwhile, Mexico has computer labs and libraries as well as classrooms but houses 45 students per classroom, thus lowering the surface area per student ratio.

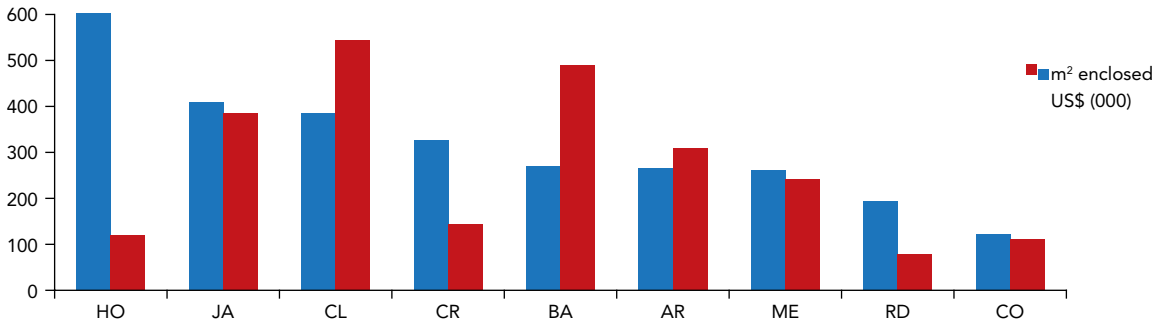
Support areas: additional and comfort-related spaces

The comfort function encompasses functional spaces such as: (i) waiting rooms for the public, (ii) various types of healthcare services, (iii) teachers' meeting rooms, (iv) teachers' offices, (v) student center, (vi) dining room, and (vii) snacks and drinks kiosk.

Again, we observe that Colombia, Barbados, and Jamaica followed by Argentina and Mexico spend more on comfort-related functional units (Figure 5). In terms of built surface area, we again see Honduras surpassing all others thanks to the size of its schools and very low construction costs, followed by Jamaica, Chile, and Costa Rica, each with covered surface areas between 300 and 400 m². With very similar surface areas close to 250 m² are Barbados, Argentina, and Mexico. Finally, the Dominican Republic & Colombia come in with covered surfaces between 100 and 200 m².

Of the countries surveyed, Costa Rica has the only general waiting areas for the public (Figure 6). The functional units dedicated to hygiene include common restrooms available in all schools. Restrooms for teachers

FIGURE 5.
Enclosed surface areas and costs of comfort-related functional spaces



and administrators only are found in six of the ten countries, the exceptions being Costa Rica, Guatemala, Honduras, and Mexico. Restrooms for the disabled are widespread in schools, though absent in Guatemala, Honduras, and the Dominican Republic. Other functional units consist of restrooms for auxiliary staff in kitchens and others, which are present only in Barbados, Chile, Colombia, Costa Rica, and Guatemala. The only three countries that have all types of restrooms mentioned are Chile, Colombia, and Barbados.

TABLE 3.
Comfort-related functional units

	Argentina	Barbados	Chile	Colombia	Costa Rica	Guatemala	Honduras	Jamaica	Mexico	Dominican Republic
Waiting area for the public					*					
Teachers' and administrative staff restrooms	*	*	*	*				*		*
Visitors' restrooms		*								
Common restrooms	*	*	*	*	*	*	*	*	*	*
Special restrooms (disabled)	*	*	*	*	*			*	*	
Kitchen support staff restrooms		*	*	*	*					
General support staff restrooms		*	*	*				*		
Student teaching assistants' lounge	*	*	*	*			*	*	*	*
Dining hall										
Kiosk	*									
Cafeteria	*		*		*		*	*	*	
Quiosco				*						
Cafetería	*									

The other functional units included in schools for their pedagogical value are teachers' meeting rooms, which are missing only in Costa Rica and Guatemala.

Learning is also closely related to students' nutritional levels. The school day being a full day, this leads many countries to adopt dining halls as a required functional unit. Among the countries surveyed, six include dining halls in their standards, while Barbados, Colombia, Guatemala, and the Dominican Republic do not. The average size of the dining halls is 247 m², with the median at 277 m².

The matrix also breaks down other complementary processes, including supply and tracking and management and administration, which will not be subject of a more in-depth analysis because, although they play a part in and give support to the operations of the school building, working climate, and the general comfort of teachers and management staff, they do not weigh directly on student results.

Conclusions

This report attempts to present an overview of the regulations and requirements LAC countries consider when designing school buildings. It was generally found that there is growing interest in regulating and standardizing the design of schools and in making spaces more cost- and use-effective. A special study of comfort levels confirmed the need for guidelines to create healthier spaces. One yet unsolved problem is the surface area of classrooms in relation to student numbers, which exhibited a wide range, from 1.1 m² to 1.81 m² per student. Moreover, although the upper range seems appropriate, it is still very far from the nearly 4 m² per student mentioned in Joensuu (Finland), as cited above.

Reduced classroom size offers limited flexibility in organizing furniture, reduces teaching possibilities to frontal instruction only, limits student participation, prevents division into groups for collaborative work, and limits the use of technology in the classroom.

As stated in the introduction, the countries of the region are coming together to meet the goal of universal elementary education. However, due to steady population growth, the inclusion and availability of infrastructure is insufficient to meeting growing demand. In fact, it will be difficult to achieve a reduction of the number of students per classroom in the short term. On the other hand, the policy of establishing an extended or full school day, as in Argentina and Honduras as well as a growing number of schools in Costa Rica, now exceeds the capacity of the existing system. In terms of costs per classroom, the range fluctuates between US$18,000 and US$81,000 per unit. The variety of construction proposals by country, the size of classrooms, and other complexities make it necessary to conduct a case-by-case study to determine what parameters to put in place in order to achieve better cost efficiency.

Comparing the areas dedicated to central and supporting processes, it is clear that there are countries with a low proportion of spaces for the former and high proportion for the latter. The average of the three countries with more than 1,000 m2 of covered spaces for support processes (Honduras, Costa Rica, and Colombia) is 2.4 times greater than the average of the covered support spaces of the other seven countries (1,345/553).

An area of approximately 1,000 m2 is dedicated to pedagogical curricular processes. The functional units that are almost universally found in new schools are classrooms and libraries, followed by computer labs. Only half have science labs, and music and art rooms are rare.

Another important aspect is the inclusion of new technologies. An analysis of the matrix highlights the permanence of computer rooms and labs in a large number of countries, consisting of confined spaces that are often locked and used at certain times only for specific classes. It is true that with the implementation of the policy of distribution of wireless portable

computers (smart phones, laptops, tablets, etc.), it will be important to rethink these spaces, assigning them new uses and resources and perhaps linking them to libraries or multi-media equipment for distance learning and video conferencing, with modern wifi networks and fully portable equipment. As regards infrastructure, schools should consider providing facilities for recharging these appliances, such as those in airports and shopping malls. Furthermore, data distribution systems must ensure that wifi signals reach all points in the school at a suitable speed.

Of the spaces corresponding to support/ancillary processes, the most popular area is the multi-purpose room. Only Colombia and Costa Rica do not seem to have them. This is followed by the office of psychological and pedagogical advisor and first-aid rooms (60%). It is interesting to note that only Barbados has integrated spaces dedicated to support (small additional rooms).

The learning environments in 21st-century schools will have to be adapted and designed according to educational advances and permanent technological changes. This implies interdisciplinary work involving students, teachers, educators, architects, engineers, administrators, and the education community in general, in such a way that school buildings are more flexible, inclusive, and sustainable and that schools' influence exceeds their physical limits in relation to the city and the landscape.

This new conception of the school is based on changes in requirements and architectural designs, its spaces, the number of students in each environment, and consequently construction guidelines and infrastructure costs. Merging environments, optimizing and reducing spaces, and the gradual disappearance of classrooms and specialized environments and their replacement by multi-purpose spaces will necessarily affect the indicators and standards currently applied. It will also require increased investment in technological support in terms of pedagogical activities and operations and maintenance ("intelligent buildings"), which, as adoption increases, will streamline and reduce costs. In addition, significant cost savings could be achieved per square meter per student by merging and rethinking traditional specialized environments and optimizing the use of school facilities.

This process must be gradual and concerned with needs, given that traditional methods are often deeply rooted in teachers and administrators.

Much has been done, yet much remains to be done. Although the work of revising the matrix for these countries has consolidated some ideas, it has also opened up new questions related to improving the quality of learning through intervention in the physical environment. That is why among the objectives of this Regional Public Goods Technical Cooperation (*Cooperación Técnica de Bienes Públicos Regionales* – CT-BPR) is the identification of these opportunities, the opening of spaces for permanent discussion, the search for solutions, and the development of recommendations that point toward the achievement of improved quality in the infrastructure in the long term.

The importance of the school habitat as a setting for teaching and learning will endure. Its importance and impact on the quality of education, as summarized by philosopher Reggio Emilia,[8] is to agree on considering the physical environment as a "third teacher," after parents and teachers. As a result, educational architecture must always be conceived as motivating and fully supportive of the learning process.

8. Available from: http://www.education.com/reference/article/Ref_Reggio_Emilia.

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