

Puerto Rico's Schools for the 21st Century

SETTING A NEW GLOBAL STANDARD FOR EXCELLENCE





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Puerto Rico's School Modernization Program has the potential to reap benefits for the economy, children and citizens of the Commonwealth that

far exceeds the immediate stimulus to the economy originally envisioned by the program.

The recently completed Master Plan for the ongoing School Modernization Program identified widespread, systemic problems with the Commonwealth's crumbling school facilities infrastructure. But the Master Plan also provided compelling evidence to suggest that the primary problem was that school buildings represented the most visible manifestation of an obsolete educational model – one better suited to the now defunct industrial era than one designed to best prepare students for 21st century lives and careers.

In a very real sense, the most valuable asset of the Commonwealth and the key to its long-term prosperity, its children, are the victims of the status quo. They are being denied the high-quality environments for learning that they deserve. And so the real problem is not just figuring out how to spend the money to fix up schools but how to leverage the government's investment towards creating a better educational model, improving educational outcomes and the lives of tens of thousands of students and teachers in the process. But how can this be done with the very limited amount of money available at each school – an average of between \$3 million -- \$5 million per school? That is the challenge that the Design Team has been asked to meet and are now well on their way towards achieving.

Design priorities have been established that will not only put each campus into a general state of good engineering repair but also transform it from its industrial age educational model into one that is much more in tune with the 21st century.

Once Puerto Rico accomplishes the objective of the Program – leverage small investments in infrastructure in a way that is truly transformative – it will firmly establish itself as a global leader and set a new direction that hundreds of municipalities in the United States and around the world can learn from and follow. After all, the vast majority of the places in which students now attend school around the world have already been built. And almost all of them are now obsolete from an educational standpoint. Puerto Rico can show the world that these obsolete buildings still have life in them, one that can be extended by

10 or even 20 years if improvements are properly designed and strategically implemented.

School Modernizations – The Elements of Success

By and large, it is safe to say that the large majority of public school buildings in Puerto Rico have serious physical and design defects to the point where they pose a major impediment to the delivery of a world-class education in the commonwealth.

The physical design of the school encourages and supports a factory-model of teaching and learning which prevails with row upon row of standardized classrooms and few other amenities. Learning opportunities rarely exist for interdisciplinary learning, peer tutoring, project based learning, naturalist learning, independent research, collaborative learning, distance learning, etc. This problem is the one that the Puerto Rico *Schools for the 21st Century* Program needs to address.

By properly leveraging school construction spending, Puerto Rico will be able to develop a new generation of 21st century schools and measurably improve academic outcomes. We should try to ensure that every dollar spent directly and positively impacts teaching and learning outcomes, improves parent participation and raises the profile of the school as an important and valued asset for the whole community.

Given the age and poor physical condition of most of the vast majority of the school facilities infrastructure, a number of important remedial measures will be included – all of which will directly help the school raise its community profile, optimize the teaching and learning environment and make it possible for educators to effectively deliver a 21st century curriculum.

The following is a list of the proposed improvements. The government is attempting to spread the modernization funds across a vast number of schools, and therefore is severely constrained with regards to how much money can be spent at any particular school. This may result in the proposed list of improvements having to be modified on a school-by-school basis so as to live within the established budgets and extend the reach of this program to all 78 municipalities in Puerto Rico.

Proposed Facilities Enhancements at Each School:

New Community Artwork Project: Each school design will include a community created art piece that will be prominently displayed (preferably by the main school entrance) to showcase community pride in the school and establish a cultural link with the surrounding neighborhood.

School Educational Vision: A slogan depicting the educational philosophy of the school will be prominently displayed along with a new school sign. This slogan will be selected by the local school community and reflect the values of the families that are an integral part of this community.

New Windows – Courtyard Facing and Outside Facing and New Doors: This will allow views into the courtyard as well as more fresh air and daylight into the classrooms – all these elements have been shown to improve student performance. Outside facing windows will also be equipped with aesthetic security screening to minimize vandalism and breakage.

A Solution for the Security Problem: The open courtyard scheme prevalent in most of the public schools built in the post-war era in Puerto Rico has intrinsic security problems built into the design. In essence, by slicing the traditional school box down the middle and opening the interior up to the courtyard, the school becomes indefensible to vandalism and theft. The result has been to remove any windows and doors from the classrooms facing the courtyard creating blank walls with severely limited access to outdoor views and natural light. The designers have studied this problem and are proposing a system of arbors at the ground floor and a system of verandas on the upper floors that will offer a physical barrier, after hours preventing access to the classrooms. The physical barrier will be accomplished via the installation of solar screen louvers that keep the verandah in shade. This will allow for the return of some transparency to the classroom walls facing the courtyards and will also create a cooler micro-climate along these surfaces to aid in natural cooling within the classrooms themselves.

New Community Space: Either an existing covered part of the school or a new covered addition with a lightweight roof in the courtyard area will be erected to serve as a **Community Pavilion**. This is a place for students to have many activities during the day and represents an amenity they currently lack. Today the schools often have no place for large group gatherings, school-based performances, physical fitness activities like dance and yoga, school-based social events, hands-on project work, casual eating, art and science exhibitions etc. The community pavilion will also be a perfect place for after school activities. Furthermore, the community pavilion will double as an “Internet Café” where parents and community residents become more involved in the life of the

school and continue to benefit from the government's investments well beyond the regular school day by remaining open during the evenings and weekends.

New Science Lab, New Art Center (if these are missing): While there are not enough funds in the modernization program to build new additions to supplement existing program space, every attempt will be made to properly outfit existing science and art spaces or convert existing spaces to these uses since they represent vitally important programs for student success.

New Social/Collaboration Areas: This will be achieved where funds allow by extending outside balconies and creating wider outdoor commons areas. In this way, teachers can choose to extend learning activities beyond the classroom. These consciously designed collaborative spaces will also serve as valuable social and emotional learning areas – and these are critical to student development though noticeably absent in most schools.

Functional and Ergonomic Furniture: While the architectural and engineering fixes will deal with the “shell” of the school, it is the manner in which individual classrooms and other learning areas are furnished that will have the most direct impact on the learning environment. Therefore, a very high priority of the modernization program is to equip the whole school with age-appropriate furniture, particularly ergonomic chairs. Teachers will also be provided with suitable professional furniture and other parts of the school such as science labs, libraries and cafeterias will all get new furniture that is customized to the special needs of these important program areas. Furnishings and their arrangements can have a major positive impact by encouraging students to work collaboratively and improve the interaction of teachers and students in the classroom.

State-of-the-Art Educational Technology: One key element that separates a 21st century school from its industrial counterpart is the ready availability of educational technology that is seamlessly integrated into the curriculum. Unfortunately, educational technology is an area in which schools in Puerto Rico lag far behind their counterparts in the United States and other developed nations. Therefore, an important goal of the modernization program is to equip the whole school with age-appropriate educational technology including high bandwidth Internet access, wall-to-wall wireless access, mobile laptop technology that can instantly convert any classroom/learning studio in the school into a “lab”, increasing computer access in the library, providing 2 desktop computers in every room, providing electronic whiteboards in strategic locations and providing students with access to other important educational technology equipment such as digital cameras, video cameras, printers and scanners as needed.

Electrical Power: This will include the provision of a new electrical sub-station if one is needed, a new distribution system if the existing one is old and needs refurbishment, new electrical panels, new light fixtures and ceiling fans in every room, Internet cabling that will allow for the installation of a school-wide wireless network, a new fire alarm system and underground primary and secondary distribution cables and feeders.

Structural: This will include alleviating obvious structural deficiencies and also ensuring that the roof is properly insulated and water-tight.

Mechanical: This project will maximize student comfort using natural ventilation and ceiling fans in lieu of additional air-conditioning. Some marginal improvements to existing air-conditioning units will be included if the budgets permit.

Modernization Summary: It is clear from reviewing the above scope of work that every attempt is being made to stretch the limited funds in a way that not only takes care of critical infrastructure repairs but also brings the school's overall design into the 21st century. While improving student achievement is the primary goal of the infrastructure investments, an important sub-goal of the program is to also increase parent and community participation and to raise the profile of education in Puerto Rico.

Cost Savings: While the focus of the modernizations is student achievement and community engagement, the program also offers some excellent opportunities for cost savings. Primarily these cost savings can be realized by standardizing design features like windows, doors and lighting fixtures and negotiating bulk prices for many other items such as furniture and equipment and educational technology. This can be achieved through the competitive purchasing of the key building components (doors, hardware, windows, casework etc.) from single national vendors. Using the buying power of the modernization program, costs in many areas can be cut by 50% or more and these savings can be reinvested in the schools themselves thus extending the reach and influence of the school modernizations. This also means all modernized schools can have standardized parts thus reducing maintenance costs and allowing schools to quickly procure replacement parts when needed.

The New Schools – The Elements of Success

Whereas the school modernizations will help Puerto Rico showcase effective methods to re-energize old facilities and extend their useful life, the five new schools that are included as part of the program can become flagships examples of the future. The new schools can make a clean break from the past by creating a new and more effective model for teaching and learning. This new model would, hopefully, go on to replace the 70-year old industrial model prototype that dominates Puerto Rico's school facilities landscape today.

Here are some of the ambitious goals that the new schools will be able to realize:

Dramatically Improve Student Achievement through the Creation of Learning Communities: There is ample evidence that dramatic achievement results are possible by organizing a relatively large school into Learning Communities of no more than 150 students each. For example, schools that have thus reorganized themselves have seen graduation rates jump from 10% to 90% and also seen substantial improvements in other areas such as attendance, reduced incidence of vandalism and social conflicts and improved parent and community participation.

Consciously Apply Research-Backed Design Principles: Over the past 15 years, there has been increasing evidence that design of school facilities can directly benefit the educational bottom line. As with the creation of Learning Communities discussed above, we now know that the proper use of daylight, the correct application of acoustics, improved natural ventilation and outdoor connections all directly benefit educational outcomes.

Create “Agile” Spaces: Schools need to directly support at least 20 distinct modes of learning such as collaborative learning, project based learning, research, independent study, peer tutoring, cooperative learning, performance and art based learning and naturalist learning to name just a few. Whereas under the older model of school design, these activities tended to be separated from each other, in the 21st century school, they are much more integrated. Thus, the design of spaces also needs to be more “agile” to support the level of flexibility that today's curriculums demand. Thus, spaces used for a dramatic performance during social studies in the morning may be used for an art critique in the afternoon and as a community gathering space in the evening.

Design Sustainable Schools: Sustainable practices takes on many forms in the design of new schools. It might include some or all of the following -- the proper orientation of the building and the deployment of proper shading devices to

minimize heat gain from the sun, utilizing solar, wind and geo-thermal energy on site (even if only for demonstration purposes) , implementing water harvesting & recycling techniques on site, the use of indigenous building materials, increasing natural ventilation to reduce dependence on air conditioning or preserving old grown trees and working with the natural contours of the land in designing the new campus. In order to create a new generation of enlightened citizens who understand the importance of preserving the Earth's beleaguered fragile eco-system, schools designs need to take the lead by showcasing the above sustainable design practices.

Develop Community Schools: The new schools that are built could set the standard for what a true community school in Puerto Rico looks like. With lifelong learning becoming the norm, the government's investment in the new campuses should provide the means by which all residents of the community and not just school-age children are benefited. In turn, as the community adopts the school, many collateral benefits will be realized such as increased property values, increased economic investments by the private sector, and better care of the schools themselves which will be seen as important community assets. It is also true that when the surrounding community feels true ownership with its neighborhood school the incidences of vandalism and theft show a significant drop.

Develop More Efficient Designs to Save Money: The best designs for 21st century schools are also the least expensive! A vast majority of new schools constructed in the United States and elsewhere still follow the “cells and bells” model in which rows upon rows of classrooms are strung along a double-loaded corridor. While this design may appear “efficient”, it is in fact a very inefficient model from a teaching and learning standpoint. The cells and bells design usually results in a “net-to-gross” ratio of 60:40. That means, out of every 100 square feet of built-up space, almost 40 SF is lost in corridors and room for other utilities. A Learning Communities design model, on the other hand, can eliminate corridors altogether and realize a net to gross ratio that is closer to 80:20. Under this scheme, out of 100 SF of built-up space, only about 20 SF is lost to circulation and other utilities. Moving from a traditional to a modern school design can represent substantial increased value – by recapturing as much as 20% more space for teaching and learning.

Establish Clear Measures of Quality: Today, there exist reliable and tested instruments to measure the quality of new school designs. The most well known measure of a school design's quality from the perspective of how well it serves 21st century teaching and learning needs is *The Educational Facilities Effectiveness Instrument* (EFEI). Unlike generic quality control instruments, EFEI provides a very specific quality measure that is fully customized to respond to local needs in Puerto Rico. By using EFEI, the government of Puerto Rico can

assure itself that the substantial investment it is making in new school facilities will result in top-notch designs. At a very minimum, the Puerto Rico schools should obtain an EFEI score of 80% or higher. This would indicate that the designs are fully responsive to the demands of today and tomorrow's curriculum and also that they are cost effective and will stand the test of time.

Integrate Professional Development Strategies to Realize Full Potential of New Designs: A good school design is only as good as it will be used in the way it is intended to be used. The most successful examples of good school design as demonstrated by strong student achievement also involve a key component of teacher professional development. There are at least two key areas of professional development that Puerto Rico should explore while it designs and constructs the new schools. The first is called Space-Based Curriculum Mapping which provides school leaders and teachers with an opportunity to directly map the desired curriculum onto the proposed spaces to test their efficacy under a variety of conditions. The second is called Educational Commissioning which provides essential training to teachers, students and other occupants of a new school so that they can take full advantage of the new facilities to improve teaching and learning outcomes. The Design Team responsible for the school modernizations in Puerto Rico has successfully employed these professional services in many school projects worldwide.

Conclusion: As the world has moved rapidly from the Industrial Age to the Creative Age, educational systems have found themselves left behind and out of touch with today's needs. This is a problem that is vastly exacerbated by the fact that most of today's education is being conducted in school facilities designed for a different time and age. Nowhere is this truer than in Puerto Rico where a majority of its public school students attend class in buildings based on a prototype developed during the 1940s and that have far exceeded their useful life. Now, with the *Schools for the 21st Century* program, Puerto Rico has a unique opportunity to break the mold and start anew. Between the school modernizations and the new schools, the Commonwealth has an opportunity to redefine its educational future – and by extension its economic future and the well-being of its citizenry for many years to come.