A. Introduction

"Education is the key to America’s economic growth and prosperity and to our ability to compete in the global economy. It is the path to good jobs and higher earning power for Americans. It is necessary for our democracy to work. It fosters the cross-border, cross-cultural collaboration required to solve the most challenging problems of our time."  

National Education Technology Plan, U.S. Department of Education

As the U.S. Department of Education recognizes, education is a key factor affecting economic growth, and the development of the knowledge base and technological advances needed to compete in a global economy. Education serves as a vehicle for strengthening the workforce and thus contributes to societal development and ensuring Puerto Rico’s future competitiveness in a global market. It is the foundation for setting values and developing the skills and abilities to solve everyday challenges.

The broadband and IT revolution underway has perhaps nowhere greater impact than in the education sector. Broadband and IT has shifted basic education paradigms and is already transforming the way our children and young population learn and grow as well as the way educators facilitate the learning process. The K-16 of the twenty-first century will be markedly different from that of the twentieth century and it will afford new opportunities for its students. That transformation, however, will not take place on its own to ensure that all citizens, regardless of income level, place of dwelling, race, ethnicity or other factors have access to those opportunities.

Broadband-enabled education solutions, properly leveraged through the K-16 system, provide new opportunities to empower educators, parents, and students. Broadband expands teachers’ instructional capabilities and boosts students’ research and interactive opportunities beyond the confines of the physical classroom and the traditional school. It empowers students to learn and share with individuals beyond traditional circles and facilitates communication between educators and parents, which promotes engaged decision making regarding student needs and abilities. Online course material makes educational attainment more flexible and accessible to more people and can significantly expand the opportunities available to students within their local schools and universities, and help expand options available to students within confined budgetary conditions.

In turn, the expansion of broadband and IT usage across the K-16 system is a key demand driver for IT and broadband technologies. As these students learn through their school experiences the value of IT and online opportunities afforded by this technology, they will become active digital citizens. Today, those same students can help guide their parents and grand-parents on how this technology can impact their lives and livelihood, and help them overcome digital literacy barriers.
Technology is at the core of virtually every aspect of our daily lives. We must leverage it to provide engaging and powerful learning experiences and content.

The federal and Puerto Rico governments understand this challenge and have recognized that fully leveraging IT and broadband resources across the K-16 educational experiences requires a holistic approach and an ongoing transformational process.

The U.S. National Education Technology Plan (NETP) recognizes that “technology is at the core of virtually every aspect of our daily lives and work, and we must leverage it to provide engaging and powerful learning experiences and content, as well as resources and assessments that measure student achievement in more complete, authentic, and meaningful ways. Technology-based learning and assessment systems will be pivotal in improving student learning and generating data that can be used to continuously improve the education system at all levels. Technology will help us execute collaborative teaching strategies combined with professional learning that better prepare and enhance educators’ competencies and expertise over the course of their careers.”

The NETP presents a holistic approach to drive this transformational process across five intersecting areas:

i. **A new learning paradigm** - The NETP calls for a review of basic teaching paradigms and asks that we “focus what and how we teach to match what people need to know, how they learn, where and when they will learn, and who needs to learn. It brings state-of-the-art technology into learning to enable, motivate, and inspire all students, regardless of background, languages, or disabilities, to achieve. It leverages the power of technology to provide personalized learning and to enable continuous and lifelong learning;”

ii. **Assessment** – The NEPT calls for the use of “data to drive continuous improvement” of our education practices;

iii. **Teaching** - The NEPT recognizes that to fully achieve this transformation, teachers need to be supported in learning how to use the technology to help their students achieve success and calls for “using technology to help build the capacity of educators by enabling a shift to a model of connected teaching. In such a teaching model, teams of connected educators replace solo practitioners, classrooms are fully connected to provide educators with 24/7 access to data and analytic tools, and educators have access to resources that help them act on the insights the data provide;”

iv. **Infrastructure** – The NEPT recognizes that “an essential component of the learning model is a comprehensive infrastructure for learning that provides every student, educator, and level of our education system with the resources they need when and where they are needed. The underlying principle is that infrastructure includes people, processes, learning resources, policies, and sustainable models for continuous improvement in addition to broadband connectivity, servers, software, management systems, and administration tools. Building this infrastructure is a far-reaching project that will demand concerted and coordinated effort.”
v. **Productivity** – The NEPT understands that to “achieve our goal of transforming American education, we must rethink basic assumptions and redesign our education system. We must apply technology to implement personalized learning and ensure that students are making appropriate progress through our P–16 system so they graduate.”

Building upon the U.S. National Education Technology Plan, the Puerto Rico Department of Education’s Technology Plan of 2010 (PRETP) sets in motion a holistic approach to jump-start this transformation across the island. The PRETP’s stated goal “ensures that students and teachers will be technologically literate and able to use technology tools to expand and improve the teaching and learning processes.” The role of technology in education is summarized as follows:

“By providing optimal conditions, such as a curriculum wholly permeated by crosswise integration of technology; on-going, sustained and intensive professional development; effective parental and community involvement in the educational process, access to technological educational resources, and decision making based on tangible data, students will be able to use technology effectively and ethically in learning, creating, solving problems, doing research, making decisions and communicating, thus taking on the responsibility of their own learning.”

To achieve this vision, the PRETP is structured around five key areas, including: “integration of technology in the curriculum, professional development, providing a technology-rich learning environment and support, community and parent involvement, data-driven decision making and accountability.”

The Puerto Rico Broadband Taskforce embraces the federal and Puerto Rico visions for a twenty-first century K-16 education and strongly supports efforts at the federal and local levels to continue testing new ideas and developing new models that enable this transformation. Building upon this work, as well as upon the research conducted by the Federal Communications Commission (FCC) in its 2010 National Broadband Plan review of the challenges faced in the education sector as ICT opens new opportunities, the Puerto Rico Broadband Taskforce calls for a holistic approach across Puerto Rico for the expansion of broadband and IT in the education sector that includes the following goals:
This chapter reviews existing data to assess to what extent Puerto Rico meets these goals today, and proposes a series of recommendations aimed at complementing ongoing work of the Puerto Rico Department of Education.

B. Broadband and Education Across Puerto Rico

1. Broadband Connectivity Across Puerto Rico K-12 Public Schools

In 2011, the broadband capacity under contract for Puerto Rico public schools was drastically below the connectivity goals stated by the FCC’s National Broadband Plan, and fell well short of the capacity goals recommended by the PRBT, namely: access to 100 Mbps download capacity by 2015, and 1 Gbps by 2020. In all but one of the seven school regions of Puerto Rico, the median broadband capacity contract across all public schools in 2011 was 512 Kbps download and 1.5 Mbps upload maximum speeds. In the region of Arecibo broadband contracts tend to offer a more symmetric download/upload service, but are still drastically below stated goals (Table VI.1).
The broadband capacity under contract across Puerto Rico public schools is drastically insufficient to meet the school connectivity goals of 1 Gbps.

None of the public schools in Puerto Rico were served by fiber-optic networks, the only technology today able to sustain symmetric broadband capacity of 1 Gbps, or even 100 Mbps. The technology platform most commonly used to provide broadband services across Puerto Rico public schools is DSL service and frame relay service. Both of these technologies are woefully inadequate to sustain the broadband connectivity vision laid out by the National Education Technology Plan where, ultimately, every administrator, every teacher, every classroom, and every student will have direct access to a safe online experience. This school capacity gap is endemic across the island and affects both rural and urban schools.

To address this from the policy perspective, we need to understand what drives this low broadband connectivity across Puerto Rico’s public schools. Is it lack of faster broadband connectivity? Or is the broadband there, but not being leveraged?

Table VI.2 provides some insights into these questions. Contrasting the school connectivity information with Connect Puerto Rico’s broadband inventory data available to residential customers across each municipality, suggests that there are municipalities where broadband is available at speeds as high as 10 Mbps, yet schools in those areas are not taking advantage of this opportunity. In short, while lack of high-capacity broadband backhaul infrastructure remains a key barrier to achieve more robust connectivity for schools across some parts of Puerto Rico, the challenge in Puerto Rico is not solely one of broadband inventory capacity. Many public schools are not contracting faster broadband capacity even when available.
### Table VI.2 - Broadband Service Across Puerto Rico Public Schools - By Municipality

<table>
<thead>
<tr>
<th>Municipality</th>
<th>School Region</th>
<th>Number of Schools</th>
<th>Median Contract Download Speed</th>
<th>Median Contract Upload Speed</th>
<th>Highest Broadband Speed Available - Residential Market*</th>
<th>Median Household Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjuntas</td>
<td>Ponce</td>
<td>12</td>
<td>1.5 Mbps</td>
<td>1.5 Mbps</td>
<td>768 Kbps down/200 Kbps up</td>
<td>$11,983</td>
</tr>
<tr>
<td>Aguada</td>
<td>Mayaguez</td>
<td>21</td>
<td>1.5 Mbps</td>
<td>1.5 Mbps</td>
<td>768 Kbps down/200 Kbps up</td>
<td>$14,103</td>
</tr>
<tr>
<td>Aguadilla</td>
<td>Mayaguez</td>
<td>25</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>768 Kbps down/200 Kbps up 0.4%</td>
<td>$13,956</td>
</tr>
<tr>
<td>Aguas Buenas</td>
<td>Caguas</td>
<td>18</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$14,751</td>
</tr>
<tr>
<td>Aibonito</td>
<td>Caguas</td>
<td>14</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$15,487</td>
</tr>
<tr>
<td>Anasco</td>
<td>Mayaguez</td>
<td>12</td>
<td>1 Mbps</td>
<td>1.5 Mbps</td>
<td>768 Kbps down/200 Kbps up</td>
<td>$15,244</td>
</tr>
<tr>
<td>Arecibo</td>
<td>Arecibo</td>
<td>34</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$16,564</td>
</tr>
<tr>
<td>Arroyo</td>
<td>Caguas</td>
<td>10</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>768 Kbps down/200 Kbps up</td>
<td>$14,815</td>
</tr>
<tr>
<td>Barceloneta</td>
<td>Arecibo</td>
<td>12</td>
<td>1.5 Mbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$16,124</td>
</tr>
<tr>
<td>Barranquitas</td>
<td>Caguas</td>
<td>16</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$17,680</td>
</tr>
<tr>
<td>Bayamon</td>
<td>Bayamon</td>
<td>68</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$25,294</td>
</tr>
<tr>
<td>Cabo Rojo</td>
<td>Mayaguez</td>
<td>16</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$15,809</td>
</tr>
<tr>
<td>Caguas</td>
<td>Caguas</td>
<td>39</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$19,851</td>
</tr>
<tr>
<td>Camuy</td>
<td>Arecibo</td>
<td>15</td>
<td>1.5 Mbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$19,851</td>
</tr>
<tr>
<td>Canovanas</td>
<td>Humacao</td>
<td>16</td>
<td>1.5 Mbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$21,934</td>
</tr>
<tr>
<td>Carolina</td>
<td>San Juan</td>
<td>45</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$28,262</td>
</tr>
<tr>
<td>Catano</td>
<td>Bayamon</td>
<td>13</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$18,144</td>
</tr>
<tr>
<td>Cayey</td>
<td>Caguas</td>
<td>23</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$19,040</td>
</tr>
<tr>
<td>Ceiba</td>
<td>Humacao</td>
<td>10</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$18,461</td>
</tr>
<tr>
<td>Ciales</td>
<td>Arecibo</td>
<td>13</td>
<td>1.5 Mbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$13,564</td>
</tr>
<tr>
<td>Cidra</td>
<td>Caguas</td>
<td>20</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$21,293</td>
</tr>
<tr>
<td>Coamo</td>
<td>Ponce</td>
<td>19</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>768 Kbps down/200 Kbps up</td>
<td>$15,028</td>
</tr>
<tr>
<td>Comerio</td>
<td>Caguas</td>
<td>16</td>
<td>1.5 Mbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$12,927</td>
</tr>
<tr>
<td>Corozal</td>
<td>Bayamon</td>
<td>15</td>
<td>1.5 Mbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$14,077</td>
</tr>
<tr>
<td>Culebra</td>
<td>Humacao</td>
<td>2</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>768 Kbps down/200 Kbps up</td>
<td>$19,868</td>
</tr>
<tr>
<td>Dorado</td>
<td>Arecibo</td>
<td>12</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$25,473</td>
</tr>
<tr>
<td>Fajardo</td>
<td>Humacao</td>
<td>9</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$19,803</td>
</tr>
<tr>
<td>Florida</td>
<td>Arecibo</td>
<td>12</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$16,246</td>
</tr>
<tr>
<td>Guanica</td>
<td>Ponce</td>
<td>12</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>768 Kbps down/200 Kbps up</td>
<td>$19,803</td>
</tr>
<tr>
<td>Guayama</td>
<td>Caguas</td>
<td>24</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>768 Kbps down/200 Kbps up</td>
<td>$17,214</td>
</tr>
<tr>
<td>Guayanilla</td>
<td>Ponce</td>
<td>11</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>768 Kbps down/200 Kbps up</td>
<td>$14,423</td>
</tr>
<tr>
<td>Guaynabo</td>
<td>San Juan</td>
<td>23</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$33,279</td>
</tr>
<tr>
<td>Gurabo</td>
<td>Caguas</td>
<td>16</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$27,416</td>
</tr>
<tr>
<td>Hatillo</td>
<td>Arecibo</td>
<td>15</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$16,421</td>
</tr>
<tr>
<td>Hormigueros</td>
<td>Mayaguez</td>
<td>21</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>768 Kbps down/200 Kbps up</td>
<td>$19,834</td>
</tr>
<tr>
<td>Humacao</td>
<td>Humacao</td>
<td>24</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$18,354</td>
</tr>
<tr>
<td>Isabela</td>
<td>Mayaguez</td>
<td>19</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>768 Kbps down/200 Kbps up</td>
<td>$13,028</td>
</tr>
<tr>
<td>Jayuya</td>
<td>Ponce</td>
<td>14</td>
<td>1.5 Mbps</td>
<td>1.5 Mbps</td>
<td>768 Kbps down/200 Kbps up</td>
<td>$15,556</td>
</tr>
<tr>
<td>Juana Diaz</td>
<td>Ponce</td>
<td>21</td>
<td>1.5 Mbps</td>
<td>1.5 Mbps</td>
<td>768 Kbps down/200 Kbps up</td>
<td>$16,406</td>
</tr>
<tr>
<td>Juncos</td>
<td>Humacao</td>
<td>15</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$17,694</td>
</tr>
<tr>
<td>Lajas</td>
<td>Mayaguez</td>
<td>12</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>768 Kbps down/200 Kbps up</td>
<td>$14,500</td>
</tr>
<tr>
<td>Lares</td>
<td>Arecibo</td>
<td>18</td>
<td>1.5 Mbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$12,199</td>
</tr>
<tr>
<td>Las Marias</td>
<td>Mayaguez</td>
<td>8</td>
<td>1.5 Mbps</td>
<td>1.5 Mbps</td>
<td>768 Kbps down/200 Kbps up</td>
<td>$13,847</td>
</tr>
<tr>
<td>Las Piedras</td>
<td>Humacao</td>
<td>18</td>
<td>1.5 Mbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$17,680</td>
</tr>
<tr>
<td>Municipality</td>
<td>School Region</td>
<td>Number of Schools</td>
<td>Median Contract Download Speed</td>
<td>Median Contract Upload Speed</td>
<td>Highest Broadband Speed Available - Residential Market*</td>
<td>Median Household Income</td>
</tr>
<tr>
<td>---------------</td>
<td>---------------</td>
<td>------------------</td>
<td>-------------------------------</td>
<td>----------------------------</td>
<td>--------------------------------------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Loiza</td>
<td>Humacao</td>
<td>10</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$19,460</td>
</tr>
<tr>
<td>Luquillo</td>
<td>Humacao</td>
<td>14</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$19,672</td>
</tr>
<tr>
<td>Manati</td>
<td>Arecibo</td>
<td>17</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$16,564</td>
</tr>
<tr>
<td>Maricao</td>
<td>Mayaguez</td>
<td>6</td>
<td>1 Mbps</td>
<td>1.5 Mbps</td>
<td>768 Kbps down/200 Kbps up</td>
<td>$10,932</td>
</tr>
<tr>
<td>Maunabo</td>
<td>Humacao</td>
<td>11</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>768 Kbps down/200 Kbps up</td>
<td>$15,225</td>
</tr>
<tr>
<td>Mayaguez</td>
<td>Mayaguez</td>
<td>21</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>768 Kbps down/200 Kbps up</td>
<td>$14,059</td>
</tr>
<tr>
<td>Moca</td>
<td>Mayaguez</td>
<td>17</td>
<td>1.5 Mbps</td>
<td>1.5 Mbps</td>
<td>768 Kbps down/200 Kbps up</td>
<td>$12,841</td>
</tr>
<tr>
<td>Morovis</td>
<td>Bayamon</td>
<td>16</td>
<td>1.5 Mbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$13,646</td>
</tr>
<tr>
<td>Naguabo</td>
<td>Humacao</td>
<td>13</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$15,250</td>
</tr>
<tr>
<td>Naranjito</td>
<td>Bayamon</td>
<td>15</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$14,275</td>
</tr>
<tr>
<td>Orocovis</td>
<td>Bayamon</td>
<td>16</td>
<td>1.5 Mbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$13,713</td>
</tr>
<tr>
<td>Patillas</td>
<td>Humacao</td>
<td>12</td>
<td>1 Mbps</td>
<td>1.5 Mbps</td>
<td>768 Kbps down/200 Kbps up</td>
<td>$14,860</td>
</tr>
<tr>
<td>Penuelas</td>
<td>Ponce</td>
<td>15</td>
<td>1.5 Mbps</td>
<td>1.5 Mbps</td>
<td>768 Kbps down/200 Kbps up</td>
<td>$14,872</td>
</tr>
<tr>
<td>Ponce</td>
<td>Ponce</td>
<td>76</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>6 Mbps down/ 1.5 Mbps up</td>
<td>$16,902</td>
</tr>
<tr>
<td>Quebradillas</td>
<td>Arecibo</td>
<td>10</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>768 Kbps down/200 Kbps up</td>
<td>$11,943</td>
</tr>
<tr>
<td>Rincon</td>
<td>Mayaguez</td>
<td>7</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>768 Kbps down/200 Kbps up</td>
<td>$16,067</td>
</tr>
<tr>
<td>Rio Grande</td>
<td>Humacao</td>
<td>16</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$20,850</td>
</tr>
<tr>
<td>Sabana Grande</td>
<td>Mayaguez</td>
<td>10</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>768 Kbps down/200 Kbps up</td>
<td>$15,497</td>
</tr>
<tr>
<td>Salinas</td>
<td>Caguas</td>
<td>21</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>768 Kbps down/200 Kbps up</td>
<td>$13,118</td>
</tr>
<tr>
<td>San German</td>
<td>Mayaguez</td>
<td>05</td>
<td>1.5 Mbps</td>
<td>1.5 Mbps</td>
<td>768 Kbps down/200 Kbps up</td>
<td>$15,016</td>
</tr>
<tr>
<td>San Juan</td>
<td>San Juan</td>
<td>130</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$23,478</td>
</tr>
<tr>
<td>San Lorenzo</td>
<td>Humacao</td>
<td>20</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$17,477</td>
</tr>
<tr>
<td>San Sebastian</td>
<td>Mayaguez</td>
<td>24</td>
<td>1 Mbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$12,115</td>
</tr>
<tr>
<td>Santa Isabel</td>
<td>Ponce</td>
<td>12</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>768 Kbps down/200 Kbps up</td>
<td>$17,605</td>
</tr>
<tr>
<td>Toa Alta</td>
<td>Bayamon</td>
<td>18</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$25,133</td>
</tr>
<tr>
<td>Toa Baja</td>
<td>Bayamon</td>
<td>23</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$23,297</td>
</tr>
<tr>
<td>Trujillo Alto</td>
<td>San Juan</td>
<td>20</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>6 Mbps down/1.5 Mbps up</td>
<td>$30,825</td>
</tr>
<tr>
<td>Utuado</td>
<td>Ponce</td>
<td>16</td>
<td>1.5 Mbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$13,509</td>
</tr>
<tr>
<td>Vega Alta</td>
<td>Arecibo</td>
<td>12</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$16,608</td>
</tr>
<tr>
<td>Vega Baja</td>
<td>Arecibo</td>
<td>24</td>
<td>1.5 Mbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$16,530</td>
</tr>
<tr>
<td>Vieques</td>
<td>Humacao</td>
<td>8</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>768 Kbps down/200 Kbps up</td>
<td>$16,220</td>
</tr>
<tr>
<td>Villafla</td>
<td>Ponce</td>
<td>15</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>768 Kbps down/200 Kbps up</td>
<td>$15,455</td>
</tr>
<tr>
<td>Yabucoa</td>
<td>Humacao</td>
<td>21</td>
<td>1.5 Mbps</td>
<td>1.5 Mbps</td>
<td>10 Mbps down/768 Kbps up</td>
<td>$16,894</td>
</tr>
<tr>
<td>Yauco</td>
<td>Ponce</td>
<td>27</td>
<td>512 Kbps</td>
<td>1.5 Mbps</td>
<td>768 Kbps down/200 Kbps up</td>
<td>$14,314</td>
</tr>
</tbody>
</table>

* Residential broadband inventory includes all terrestrial platforms except for mobile service.

The percentage of Puerto Rico residents who access online education (38%) resources is significantly lower than the Connected Nation average (52%).

2. The Education Digital Gap In Puerto Rico

To fully achieve the benefits of broadband and IT in the education sector, it is necessary that each K-16 student has 24/7 robust and safe online educational resources. Achieving universal, robust and safe access for each student and teacher within the confines of the school, community college, or university is not enough. The educational paradigm of the twenty-first century calls for an always-on, much broader access to online educational resources and experiences, which must include access in the home.\(^8\)

To meet the education technology goals, all households must have access to broadband and the willingness and necessary tools and knowledge to connect to a broadband network from their homes, or from mobile devices. As has been described in detail in Chapter III of this Strategic Plan, the digital gap across the Puerto Rico residential market is acute. In 2010, only 31% of all Puerto Rico households subscribed to a broadband service, representing a significant lag with other developed nations. Further, the average speed of these residential subscriptions is relatively slow and insufficient to meet the increasing demand for broadband capacity driven by the ever-increasing expansion of bandwidth-intensive online applications.\(^9\)

As online education applications rapidly extend educational opportunities outside of the classroom, a vicious cycle expanding the gap across the digital have- and have-nots is exacerbated. Students with access to broadband at home may develop an advantage over those students who can only access these resources at their public schools and libraries, furthering the effects of the digital divide. Data indicates that the residential digital gap across Puerto Rico is already driving this vicious cycle.

According to Connect Puerto Rico’s 2010 Residential Technology Assessment,\(^10\) 38% of Puerto Rico’s residents utilize online education applications; a percentage that is significantly less than the 52% average reported by residents living in jurisdictions surveyed by Connected Nation.\(^11\)

In Puerto Rico, this includes 36% of residents who used the Internet to conduct research for schoolwork, 12% of residents who utilized the Internet to communicate with teachers, and 7% who pursued online classes (Table VI. 3).

| Table VI.3 - Percentage of All Residents who Utilize Online Education Applications |
|---------------------------------|---------------------|---------------------|
|                                | Connected Nation Average | Puerto Rico Average |
| Use any e-Education application | 52%                  | 38%                  |
| Research for schoolwork         | 39%                  | 36%                  |
| Communicate with teachers       | 32%                  | 12%                  |
| Take online classes             | 20%                  | 7%                   |
Among Puerto Rico households with children, usage of online education applications increases dramatically, but is still significantly lower utilization than reported among other U.S. jurisdictions surveyed by Connected Nation. Connect Puerto Rico’s research indicates that in 2010, 58% of Puerto Rico’s households with children utilized online education applications; in comparison, 73% of households with children surveyed by Connected Nation in 2010 reported utilizing online education resources (Table VI.4). Interestingly, while Puerto Rico’s utilization of the Internet to complete research for schoolwork is consistent with the Connected Nation average, other applications such as communicating with teachers online and taking online classes remains significantly less than the Connected Nation average. For example, more than one-quarter of households with children (27%) located in jurisdictions surveyed by Connected Nation report taking classes online; while only 8% of Puerto Rico’s households with children report doing so.

This gap is not solely driven by Puerto Rico’s lower residential broadband adoption rates. Analysis of broadband-connected households delivers interesting results. When compared to the Connected Nation average, broadband-connected households in Puerto Rico are actually more likely to utilize the Internet to complete research for schoolwork (Table VI.5). However, broadband-connected households are significantly less likely to communicate with their teachers or take online classes. These findings could suggest that, rather than Puerto Rico’s residents being hesitant to adopt and utilize online education resources, instead, Puerto Rico educational institutions are lagging in their offering of online content and applications. For example, students with a home broadband subscription do not rely on a Puerto Rico based education provider for online research tools, as these services are provided by numerous web-based services. However, services that would commonly be delivered by Puerto Rico based educational institutions (online classes or teacher-parent and teacher-student communication) are not being offered.

**Table VI.4 - Percentage of Households with Children who Utilize Online Education Applications**

<table>
<thead>
<tr>
<th></th>
<th>Connected Nation Average</th>
<th>Puerto Rico Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use any e-Education application</td>
<td>73%</td>
<td>58%</td>
</tr>
<tr>
<td>Research for schoolwork</td>
<td>58%</td>
<td>55%</td>
</tr>
<tr>
<td>Communicate with teachers</td>
<td>50%</td>
<td>12%</td>
</tr>
<tr>
<td>Take online classes</td>
<td>27%</td>
<td>8%</td>
</tr>
</tbody>
</table>

**Table VI.5 - Percentage of Broadband-Connected Households who Utilize Online Education Applications**

<table>
<thead>
<tr>
<th></th>
<th>Connected Nation Average</th>
<th>Puerto Rico Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use any e-Education application</td>
<td>65%</td>
<td>64%</td>
</tr>
<tr>
<td>Research for schoolwork</td>
<td>49%</td>
<td>60%</td>
</tr>
<tr>
<td>Communicate with teachers</td>
<td>42%</td>
<td>22%</td>
</tr>
<tr>
<td>Take online classes</td>
<td>26%</td>
<td>16%</td>
</tr>
</tbody>
</table>
This gap persists among Puerto Rico’s broadband-connected households with children. Whereas eight out of ten broadband-connected households with children located in jurisdictions surveyed by Connected Nation report utilizing an e-Education application (including 57% who communicate with teachers and 31% who take online classes), only 68% of similar households in Puerto Rico report doing so (including 16% who communicate with teachers and 13% who take online classes) (Figure VI.6).

Broadband can be an important tool to help educators, parents, and students meet major challenges in education. Such opportunities will be fully leveraged only if all parents and students have the capacity, knowledge, and willingness to connect to broadband in their homes. If the digital gap is not closed, Puerto Rico’s education system may be at risk of falling behind. Chapter V of this Strategic Plan discusses in depth the broadband adoption gap across Puerto Rico and proposes a series of recommendations to help close this gap. Such efforts must be built in coordination and collaboration with efforts to close the digital gap across Puerto Rico K-16 educational institutions.

3. Educational Technology Reforms Underway

Recognizing the importance of investment in education, the Government of Puerto Rico has launched an aggressive plan to modernize the island’s public schools through the 21st Century Initiative. This initiative is a comprehensive, island-wide school modernization program that is investing $756 million to transform over 100 public schools to benefit students, parents, educators, and communities. The initiative is based on a unique public-private partnership to leverage the government’s investment in creating a modern school environment and a better educational model - improving the lives of tens of thousands of students and teachers in the process. This 21st Century Initiative is one key step necessary to address the challenges of a modern, twenty-first century education system. These structural reforms are complemented through multiple efforts across the Department of Education, higher-education community, and private stakeholders to tackle concomitant reform challenges necessary to fully leverage broadband and ICT to empower our children for a better future.

<table>
<thead>
<tr>
<th>Table VI.6 - Percentage of Broadband-Connected Households with Children who Utilize Online Education Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Among broadband-connected households with children</td>
</tr>
<tr>
<td>Use any e-Education application</td>
</tr>
<tr>
<td>Research for schoolwork</td>
</tr>
<tr>
<td>Communicate with teachers</td>
</tr>
<tr>
<td>Take online classes</td>
</tr>
</tbody>
</table>
a. Reforming K-12 Educational Technology Usage in Puerto Rico

At the K-12 level, the Puerto Rican government is currently developing and implementing plans to provide resources for:

- The integration of technology into the curriculum,
- An assurance of continuous professional development opportunities for teachers,
- Offering parental and community involvement and capacitation on matters related to technology so that they are digital citizens,
- Providing greater access to technological resources in all schools, every classroom, and for each student in the system,
- Assuring that students are critical thinkers capable of using technology in a creative and responsible manner for problem solving.

The Puerto Rico Department of Education (PRDE) has been developing and implementing a series of initiatives and projects directed to two major objectives: Reinforce and revamp the technology infrastructure in schools and all the dependencies of the agency and promote the integration of technology to the curriculum through the continuous training of teachers and administrative personnel and the provision of access to technology to teachers, students, and their parents.

The Internet service and maintenance of the network infrastructure is included in the PRDE 2012 eRate funding application. This federal program pays up to 90% of the total Internet and telephone services, basic maintenance of network infrastructure, and internal connections required for schools. The PRDE has developed a plan to gradually expand the Internet bandwidth of all the schools in Puerto Rico. In 2012, a total of 692 schools will be upgraded to 3 Mbps. These schools were selected based on the usage demonstrated in the monitoring reports and their inclusion in academic integration projects.

Moreover, in 750 schools up to three classrooms with 25 computers will be connected with a terminal server that will enable teachers and students to access materials and information and participate in collaborative projects with students from others schools in Puerto Rico and around the globe. Access to other areas of these schools will be granted through the installation of additional drops and access points. Through the eRate application the remaining schools will be included in a similar effort. These schools will be able to take advantage of projects like the Intel Teach Program, Operación Éxito, and other important initiatives designed to enhance the academic achievement of students. This effort will also help maximize the Electronic Libraries Initiatives that is already implemented in more than 167 schools around the island.
The 21st Century Schools program is an effort of the current administration to remodel more than 100 schools. This effort is directed toward the renewal of the physical and the academic strategies in the school in order to change the whole approach of education, moving it forward to the new concepts of the twenty-first century. As part of this new strategy, emphasis is on Internet access through the whole school and the use of mobile devices (laptops, netbooks, and tablets) that will help support strategies of collaboration and the use of open spaces. These schools will have 10 Mbps bandwidth and will be the first ones that offer Internet access to the surrounding community.

On the other hand, the Technology and Curriculum Unit is in charge of the initiatives in the Department of Education that integrate the use of technology into the curriculum and instruction in order to improve and enhance efforts toward academic achievement and accountability. These efforts are expected to ensure the implementation of powerful instructional practices in the delivery of course content, assessment, and state standards and expectations. Some of these projects include:

- CeL (Cursos en Línea / Online Courses) – CeL is an innovative project that offers distance courses in various subject matters to students from 10th to 12th grade.
- CITEd (Centros de Innovaciones Tecnológicas para la Docencia / Technology Innovation Centers for Educators) – These centers provide support in areas related to the use of technology in the educational process.
- CENIT (Centro de Iniciativas Tecnológicas / Technological Initiative Centers) – These centers contribute to the development of the infrastructure and the academic content areas through professional development activities and the provision of technological resources.
- EE (Editorial Electrónica / Electronic Press) – Creates and develops multimedia productions to satisfy the need for reference materials to supplement and enrich the curriculum.
- TEEE (La Televisión como Estrategia Educativa Efectiva / Use of the television as Effective Educational Strategy) – This strategy integrates the use of the television as a resource to enhance the teaching learning process.
- PVAD (Plataforma Virtual de Alfabetización Digital / Digital Literacy Virtual Platform) – The primary purpose of this initiative is to develop competencies related to digital literacy in teachers and 8th grade students as required by federal mandate.

b. The Role of Higher Education

Higher education is to be viewed as a focal point impacting all facets of the development of digital literacy. It is the role of higher education institutions to provide students, alumnae, and faculty with effective access to technological information resources and training to strengthen their information competencies.
Higher education trains the future work force of Puerto Rico, offering training on discipline-specific technological knowledge. It is through higher education that teacher candidates are trained; it is the teacher candidates who will go on to educate K-12 students as digital users and serve as facilitators for parent and community literacy on technological matters. At the same time, higher education institutions serve as providers of professional development initiatives related to information technology for current teachers. Many higher education systems make use of their community service initiatives to offer their surrounding communities technological centers and develop activities geared at achieving an increased awareness of the need for digital citizenship. Finally, universities offer access to the Internet across their campuses to assure that learning through technology surpasses the physical limits of the classroom. Thus, it is necessary to provide broadband access for all research centers, meeting and study areas, libraries, and laboratories. Finally, it is through the higher education system that continuous technological knowledge and advances are achieved (Figure VI.1).

Figure VI.1 - Higher Education's Impact on Developing an Information Literate Community
Hence, it is necessary to implement a new approach to research and development (R&D) in education focusing on identifying innovative best practices in integrating technologically driven learning experiences, and transferring existing and emerging technology innovations into education. Thus an enhanced broadband infrastructure further promotes the development of R&D proposals for education to be funded externally, while strengthening current initiatives underway. This in turn implies an opportunity to further develop science and technology programs at the higher education level, while impacting the K-12 system with a more technology literate faculty. By promoting aggressive broadband expansion across Puerto Rico, we will open the possibility to adopt the NETP model of learning powered by technology, with goals and recommendations in five essential areas: learning, assessment, teaching, infrastructure, and productivity.

**c. Reform of Teacher Accreditation**

Higher education in Puerto Rico is regulated by the accreditation of the Middle States Commission on Higher Education (MSCHE). To comply with accreditation requirements, institutions must meet 14 standards of various natures, many of which emphasize technology integration to the curriculum.

Specifically, accreditation requirements on technology include:

- Assurance that, upon degree completion, students are proficient in technological competencies appropriate to their discipline.
- Evidence that institutions have articulated expectations of student learning outcomes for information literacy and technological competence.
- Evidence that institutional support resources include the necessary technological infrastructure for instruction, the delivery of optimal student support services, and administrative processes.
- Evidence that institutions are providing learning opportunities that afford students with the ability to understand the economic, legal, and social issues surrounding the use of information and information technology (i.e., digital citizenship).
- Evidence that institutions are providing both students and instructors with the knowledge, skills, and tools needed to use the information, new technology, and media for their studies, teaching, or research.
- Evidence that institutions are offering periodic updating or retraining as information technologies emerge.
The integration of technology for instruction and assessment is also a key element of the requirements outlined by the National Council on the Accreditation of Teacher Education (NCATE). It is the accrediting agency’s expectation that institutions that offer Teacher Preparation Programs are committed to preparing candidates who are able to use educational technology. As such they must provide the necessary instruction and assess students’ knowledge, skills, and dispositions for integrating technology in their practice and facilitate student learning through the integration of technology. It is also required that the field experiences offered at K-12 schools have the necessary infrastructure so that candidates can use technology to support teaching and learning. Faculty offering instruction to teacher candidates must also be technologically literate and integrate technology into their own teaching. Finally, it is expected that Teacher Preparation Programs have adequate information technology resources to support both their faculty and candidates.

All of the aforementioned technological requirements for the K-16 environment rely primarily on fast and reliable broadband access. The Puerto Rican K-16 education system needs to be revamped by the broadband-enabled learning revolution to meet its responsibilities along with accreditation requirements. By doing so, the children, college students, community, and professionals seeking development experiences, can benefit from the advantages afforded by advances such as the use of digital textbooks. This is an opportunity to acquire knowledge through lessons personalized to students’ learning styles and aptitudes while offering real-time data and feedback to parents and teachers. By immersing the people of Puerto Rico in this technology agenda, teachers, students, parents, and the community at large will not only have state-of-the-art technology at school, but they will have access at the community and at home. What does this mean? That access to digital literacy will not be limited to the classroom, it will be present in every aspect of a learner’s life, thus reinforcing continuous learning.
C. Policy Recommendations to Accelerate Adoption and Usage of Broadband and ICT Solutions In Education

1. Promote a Collaborative Effort Across Government Agencies and Private Stakeholders

Making the vision of the National and Puerto Rico Education Technology Plans a reality will take time, many iterative stages, and involve multiple Puerto Rico government agencies, private stakeholders, and coordination with federal agencies. Implementing this vision includes reforms in teacher accreditation plans, revisions of K-16 technology curriculum, a complete reevaluation of the role of the textbook in the learning process, development of electronic curricula and content, a revamping of electricity and broadband infrastructure across all schools to ensure a level of connectivity, energy backup sufficient to meet the IT needs of the twenty-first century school, innovative approaches to ensure that all students have adequate devices to access all of these resources, etc.

The challenge is great; the opportunity even greater.

Leading this process in Puerto Rico is the Department of Education and the process set in place in its Education Technology Plan of 2010. Other government agencies are part of this process, as well as private stakeholders, including the broadband provider community and companies in the IT sector across Puerto Rico. The Puerto Rico Broadband Taskforce extends a collaborative hand to the Department of Education as it implements this program. Specifically, the Puerto Rico Broadband Taskforce can support this initiative by helping coordinate and plan for the expansion of broadband capacity supporting our schools’ IT needs.

Recommendation:
Promote a collaborative effort across government agencies and private stakeholders
2. Leverage the Demand for Broadband Across Education Institutions to Promote Competition and Investment in Broadband Service

Demand for broadband capacity across the approximately 1,500 public schools and higher-education institutions in Puerto Rico constitutes a key segment of the overall demand for broadband across Puerto Rico community anchor institutions. The purchasing power of this collective, managed by the Department of Education, should be leveraged to help promote greater competition in the broadband market and drive increased investment in backhaul and last mile broadband capacity.

For example, where broadband capacity is lacking at the local level, school districts should be empowered to seek partnerships with other local high-capacity demand institutions, including local civic leaders, government entities, public safety agencies, libraries, hospital or clinics, in a coordinated effort to aggregate local demand needs for increased broadband capacity and service. By aggregating demand within a local community, these institutions will be able to demonstrate to interested broadband providers existing pent-up demand and help justify private investments to bring greater capacity backhaul service to that community. That increased backhaul capacity can in turn benefit the whole community.

Recommendation:
Leverage the demand for broadband across education institutions to promote competition and investment in broadband services
3. Develop Plans to Achieve a Computer-Per-Teacher and Device-Per-Pupil Goal

These devices should have appropriate software and resources for research, communication, multimedia content creation, and collaboration for use in and out of school. This goal, set forth by the National Education Technology Plan, presents a great challenge for Puerto Rico. As Chapter III of this Strategic Plan documents, with only 31% of homes subscribing to broadband in 2010, the residential broadband adoption rate in Puerto Rico is significantly lagging behind many other developed economies, including all states across the U.S. According to research conducted by Connect Puerto Rico, an estimated 443,000 children in Puerto Rico do not have access to broadband in the home. The challenge set forth by the NETP is, hence, all the more necessary in Puerto Rico. Key aspects that need to be addressed to meet this challenge are the financial constraints of many Puerto Rico families who today live under the poverty level, and will not be able to afford the necessary equipment to achieve these goals.

There are numerous initiatives at the U.S. federal level to help overcome this challenge. The FCC’s Learning On-The-Go pilot program of 2011 is testing a model whereby the FCC funds a broadband-enabled device (a computer or tablet) for each student, connected to the Internet via a secure school portal. With this pilot program, currently underway across 20 schools in the U.S., the FCC hopes to develop policies that will help achieve this goal. Similarly, the U.S. Department of Education is assessing plans to make this goal viable.

Puerto Rico stakeholders, including the Department of Education, the ICT community, and the Broadband Taskforce, should work together to assess this challenge across Puerto Rico and develop plans to complement federal initiatives.

**Recommendation:**
Develop plans to achieve a computer-per-teacher and device-per-pupil goal
4. Ensure K-16 Institutions Have Appropriate Legal and Procedural Frameworks to Perform Effective Network Management

The integration of a successful technology plan throughout any academic scenario opens a myriad of possibilities to strengthen learning by access to greater information resources, new learning modalities, and ample opportunities for enriching the cultural and global knowledge base of a community. Just as well, it sets forth a challenge to academic institutions offering open access to all students, teachers, and administrators. Information technology administrators need to balance the desire for access and peer-to-peer connectivity with available bandwidth constraints, the need to assure academic integrity, and ensuring that copyright laws are respected.

The Higher Education Opportunity Act (HEOA) of 2008, effective as of July 1, 2010, set forth several regulations regarding unauthorized sharing on institutional networks. This implies that institutions of higher education are to develop and implement technological plans that effectively dissuade the “unauthorized distribution of copyrighted material” by users through the implementation of technological deterrents. Specifically, institutions must develop written policies that are periodically assessed. While providing for the authority of each institution to determine the manner and content of said policies, each must contemplate the following “technology-based deterrents”: bandwidth shaping, identification of the largest bandwidth users, programs that respond to the Digital Millennium Copyright Act (DMCA). Care must be taken to guarantee that regulations include actions to be taken against those who violate institutional dispositions, and that when policies are approved they are amply distributed among the student population.

**Recommendation:**
Ensure K-16 institutions have appropriate legal and procedural frameworks to perform effective network management
5. Digital Technology Curricula

In order to improve and enhance efforts toward academic achievement and accountability, the Department of Education’s Technology and Curriculum Unit is working to integrate the use of technology into the curriculum and instruction of the K-12 system. These efforts are essential to ensure that teachers and students have the tools necessary to fully leverage online resources to enhance the educational experience and that students graduate with the necessary knowledge to succeed in the twenty-first century economy. This reform should aim to achieve an enhanced Digital Technology Curricula that leverages the wealth of online content development by non-for-profits and private corporations alike. Particular emphasis should be given to the integration of technology in the curricula and learning tools of STEM programs, ensuring they are available in both Spanish and English. These efforts should also assess the possibility of using Puerto Rico as a testing ground for models that use online resources to enhance inclusion of Hispanic students in the education system.

**Recommendation:**
Continue integrating the use of technology into the curriculum and instruction of the K-12 system, with particular emphasis given to STEM, bilingual programs

6. Expand Resources to Train the Teacher

The Puerto Rico Education Technology Plan of 2010 sets forth accelerated plans to expand resources to train Puerto Rico teachers the necessary digital literacy skills and educational strategies to fully leverage the opportunities offered by online learning. It is imperative that this process continues at a fast rate giving all Puerto Rico teachers an opportunity to benefit from this transformation. We can achieve broadband connectivity at all schools at great capacity of 100 Mbps or 1 Gbps, but if teachers don’t have the technical knowledge and educational vision to know how to use these resources, Puerto Rico students will not be able to reap the benefits of this opportunity. To achieve this goal it is imperative to continue revising, creating, and implementing standards and learning objectives using technology for all content areas.

**Recommendation:**
Expand resources to train the teacher to ensure they are able to fully leverage ICT solutions in the classroom
7. Launch Pilot Programs to Assess the Efficacy of Online Education Modules

Will online education modules be effective for all subject matters? Is it appropriate at all age levels or only once students reach a certain maturity? How should we leverage the plethora of existing, free or low cost educational and tracking resources available online today for both teachers and students? Examples of such content abound and include the Khan Academy curricula, Intel Corporation's educational content, and many more. What other resources will be needed? Are there lessons to be learned from existing higher-education online courses that can be applied to the high school or below experience? How can higher-education institutions help expand these resources within K-12? These and many other questions need to be assessed in order to effectively leverage online training and courses in the K-12 system. Pilot programs can bring together appropriate stakeholders to assess these questions and ultimately accelerate expansion of these new educational opportunities.

**Recommendation:**
Launch pilot programs to assess the efficacy of online education modules

2 Ibid.

3 Ibid.


5 Ibid.

6 Ibid.


8 Ibid.

9 See Chapter 3 for a detailed analysis of the digital gap across the residential sector in Puerto Rico.


11 In 2010, Connected Nation conducted random digit dial (RDD) telephone surveys of 15,647 adults age 18 and older across thirteen jurisdictions, including Alaska, Florida, Illinois, Iowa, Kansas, Michigan, Minnesota, Nevada, Ohio, Puerto Rico, South Carolina, Tennessee, and Texas.

