Codifying a Next-Generation Education System

New York City iSchool

Submitted to CISCO Global Education Group

Prepared by Education Development Center, Inc.

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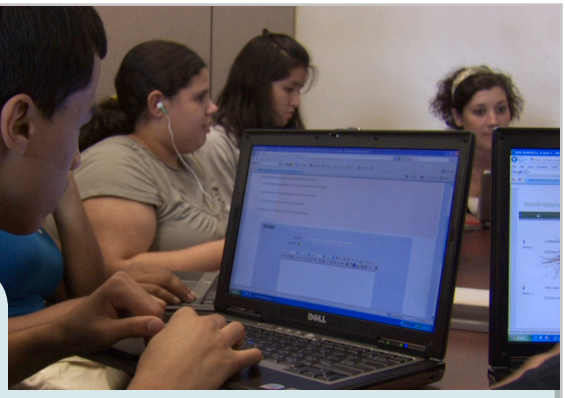

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America will not succeed in the 21st century unless we do a far better job of educating our sons and daughters. In an economy where knowledge is the most valuable commodity a person and a country have to offer, the best jobs will go to the best educated, whether they live in the United States or India or China. In a world where countries that out-educate us today will out-compete us tomorrow, the future belongs to the nation that best educates its people. The United States, a country that has always led the way in innovation, is now being outpaced in math and science education. . . . And most employers raise doubts about the qualifications of future employees, rating high school graduates' basic skills as only fair or poor.

PRESIDENT BARACK OBAMA
2009

Introduction

The world outside schools is changing rapidly with the advances of technology and economic requirements for a 21st-century global citizenry. Today, technology has moved into our everyday lives and is becoming a pervasive part of how we work, learn, and play (Carpenter, 2003; National Telecommunications and Information Administration, 2004; Parsad & Jones, 2005; Rainie, 2005; Rainie & Horrigan, 2005). Access to simulations, online social networking, interactive games, and cellular phones has drastically increased in the last decade. Further, the World Wide Web has become a powerful medium for commerce, communication, and information searching and sharing. According to a survey by the Pew Internet & American Life Project[1] covering the period 2005–06, 93 percent of teens (12 to 17 years old) used the Internet, and most of them had access to at least one high-speed service that permits a wide range of technology activities. Approximately 65 percent of teens are creating online content and sharing artifacts (e.g., artwork, photos, videos), building Web pages, writing online journals, maintaining a personal Web page, and designing their own online material by remixing content from online sources. In addition, they access the Internet using mobile hand-held devices (e.g., cellular phones, smart phones). Nearly 85 percent of teens own at least one of these social media tools and about one-third send text messages to friends regularly (Lenhart, Madden, Macgill, & Smith, 2007).

Similarly, networked communications and computer technology have transformed the modern workplace dramatically, touching nearly every career and job category from entry level to seasoned professional—making skills once confined to a small group of technology enthusiasts into basic requirements for the mainstream and bringing the global community closer to our doorstep. In the last two decades, the United States invested heavily in the application of new information technologies in virtually every sector of the economy (National Center on Education and the Economy, 2007). Today's workplaces require their employees possess a suite of 21st-century skills, including critical thinking and problem solving, collaboration across networks and leading by influence, agility and adaptability, initiative and entrepreneurialism, effective oral and written communication, the ability to access and analyze information, global awareness, civic literacy, economics education, and curiosity and imagination (Wagner, 2008; Partnership for 21st Century Skills, 2003). The demands for these skills, particularly as enabled by technology, have grown steadily over recent years (NCEE, 2007). A growing body of international and United States-based

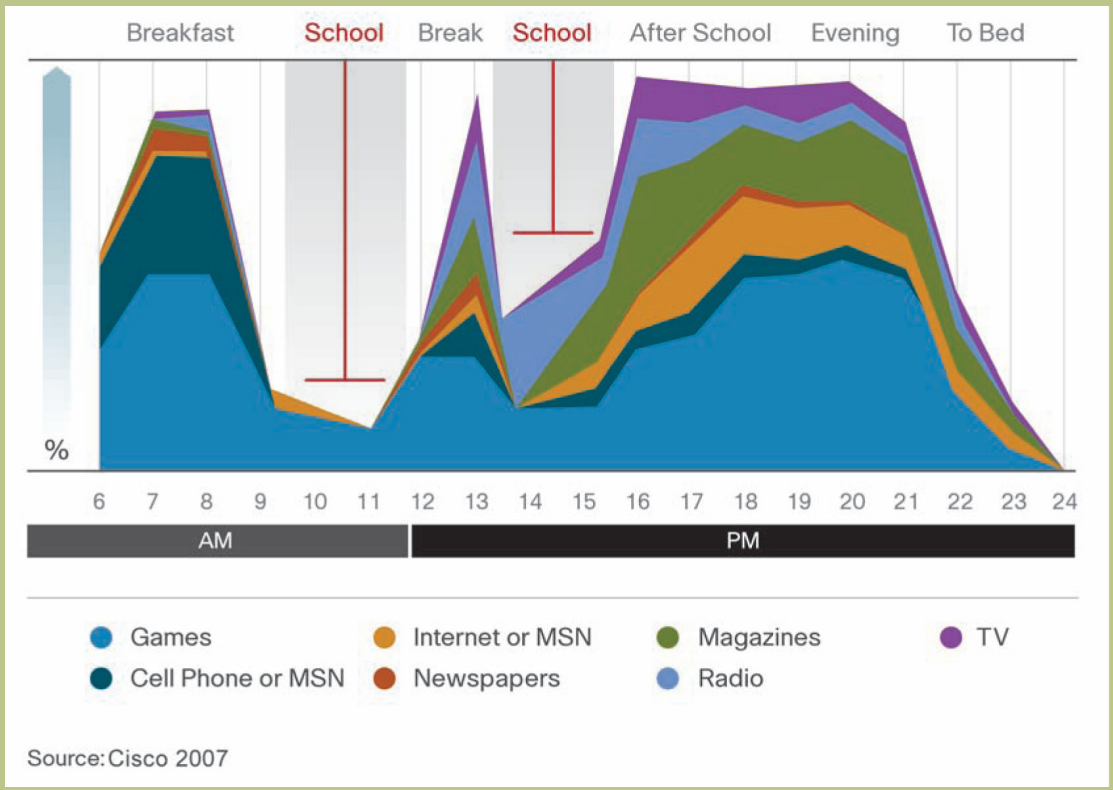
[1] The Pew Internet & American Life Project housed at the Pew Research Center, a nonprofit organization (see www.pewinternet.org), investigates the impact of the Internet on education, health, families, communities, and political life.

studies demonstrates that upward mobility in employment is increasingly dependent on the mastery of a set of high-level cognitive and communicative skills (Autor, Levy, & Murnane, 2002, 2003; ETS, 2005; Honey, Fasca, Gersick, Mandinach, & Sinha, 2005; Levy & Murnane, 2004; Organization for Economic Co-operation and Development [OECD], 2004; OECD & United Nations Educational Scientific and Cultural Organization, 2003). Such skills include the ability to diagnose and respond to complex situations, and synthesize and communicate multifaceted information to multiple audiences. Moreover, initial studies not only have found that skilled technology users earned wages that were 10 percent to 15 percent higher than those of otherwise similar nonusers (Handel, 2003), recent studies about globalization and technology—which are creating a leveled playing field in terms of time and distance—raise concerns that America is losing its international competitive edge (Friedman, 2005).

Despite steady progress in the availability and integration of technology innovations in workplaces and afterschool settings (e.g., homes) around the world, similar advancements in the use of technology to support teaching and learning in formal settings have been limited (see Figure 1). Most current education systems face daunting challenges in their efforts to prepare students for the 21st century. "Workers entering the labor force in the United States are less educated than young people in many other countries. The proportion of U.S. students who graduate from high school today—about 70 percent—is smaller than that of their counterparts in most other developed countries, and fewer than half of this group graduate with the skills needed for college and jobs that pay more than minimum wage . . . " (Wagner, 2008, p. 12). This concern is all the more troubling for disadvantaged young people.[2] Research shows persistent inequities in the opportunities students have to acquire and exercise high-level literacy skills in Information and Communication Technologies (ICT). Higher-income students use computers more often for more sophisticated intellectually complex applications, whereas lower-income students use computers more often for repetitive practice (Partnership for 21st Century Skills, 2003). Further, the full set of 21st Century skills outlined above is not taught consistently in U.S. classrooms (Schwarz & Kay, 2006). As a result, there is a serious gap between the requirements of the fastest growing jobs in the U.S. and the skills of high school graduates (Peter D. Hart Research Associates/ Public Opinion Strategies, 2005). Technology access and use alone—the standard commonly used by school systems—is no longer a sufficient measure of what school systems need to offer their students. Instead, educators must embrace a vision of technology that targets the teaching and learning of 21st-century skills and closing the achievement gap.

[2] We use the term "disadvantaged" to refer to youth whose opportunities to advance their own chances are hampered by being from low-income families or by residing in a low-income neighborhood. Our use of the term does not imply cognitive or cultural deficits of any kind.

Figure 1. Daily Media Consumption by Percentage in the Netherlands



In response to these challenges, a range of business, government, and research organizations—including the U.S. Department of Education, the National Science Foundation, the CEO Forum, the North Central Regional Education Laboratory, the Partnership for 21st Century Skills, the International Society for Technology and Education, the Technology Literacy Assessment Working Group for the State Educational Technology Directors Association, and the National Center on Education and the Economy—are calling for the transformation of current education systems. Their ultimate goal is to help create school systems that can ensure a U.S. competitive edge in the global economy (NCEE, 2007; Finn, 2008; Moe & Chubb, 2009). Public-private partnerships can play a critical role in achieving this goal, and " . . . business leaders seem determined to find something, anything, to shake things up—whatever it takes to get better results" (Wagner, 2008, p. xiii). At the core of their approach is the concept of innovation or, more precisely, "disruptive innovation."

Disruptive Innovation Theory

In the business world of entrepreneurs and corporations, innovation is commonly studied and celebrated as one of the best and most carefully organized processes to improve products or services. A standard innovation process affects change through four key steps: (1) introduce a paradigm shift by changing predominant views of the business model of how customers are served and companies execute their business, (2) develop clear execution processes, (3) position the products and services by identifying the customers and how they are

communicated with, and (4) be clear about the products and services being offered (Barnes and Conti Associates & Francis, 2007; Sutton, 2002). Disruptive innovation, on the other hand, " . . . almost *always* trips up well-managed, improving companies. Disruption is difficult because the definitions and trajectories of improvement change. What were valuable improvements before the disruption now are less relevant. And dimensions of the product that had been unimportant become highly valued." (Christensen, Horn, & Johnson, 2008, p. 44). Disruptive innovation challenges customers to shift their expectations. Christensen and colleagues (2008) posit that public schools in the U.S. have been able to improve and maneuver the rigid accountability disruptions imposed by such policies as the No Child Left Behind Act, but have not been able to transform themselves into 21st Century learning environments. This latter challenge has pushed some local government leaders (e.g., city mayors) in large cities (e.g., Boston, Chicago, New York City) across the country to enter into public-private partnerships in order to experiment with the concept of disruptive innovation and increased mayoral control (Wong, Shen, Anagnostopoulos, & Rutledge, 2007). In New York City, the leadership in cooperation with philanthropic and corporate sponsors promoted early on the broad and passionate implementation of 21st Century education and introduced a small-scale innovative technology infrastructure and tools, and administrative and instructional policies and practices, which have disrupted the system and are now being scaled up throughout the system.

New York City Education Reform Efforts

Using some of the strategies listed above, New York City has embarked on a bold reform strategy to improve its heavily bureaucratic system, which comprises approximately 1,500 schools, 1.1 million students, 77,000 teachers, and 60,000 staff (Moe & Chubb, 2009). Six key factors helped catalyze the reorganization of the system and implementation of an innovative education reform agenda:

1. A billionaire business leader became the mayor of the city in 2001.
2. The mayor took total control of the education system in 2002.
3. The mayor hired a lawyer as the chancellor of the New York City public school system with the mandate to reorganize the education system with new leadership teams and business partners, and "to bring basic business practices of accountability and transparency to the system" (Moe & Chubb, 2009, p. 92).
4. The mayor and chancellor transitioned the education leadership from a board (New York City Board of Education) to a department of education (New York City Department of Education [NYCDOE]) in 2002.
5. In 2005, the NYCDOE received $24 million in grants from private funders to support the transformation of its education system. Initial funders included the Bill & Melinda Gates Foundation, the Carson Family Charitable Trust, Mortimer B. Zuckerman,[3] and the Judy and Michael Steinhardt Foundation (NYCDOE, 2005). The NYCDOE received additional support from Cisco, which is serving as a strategic partner. Other partners have donated money, in-kind services, and products.

[3] Mortimer B. Zuckerman is the editor-in-chief of *U.S. News & World Report,* chairman and co-publisher of the *New York Daily News,* and a real-estate businessman.

6. The NYCDOE built partnerships with local higher education institutions (e.g., Columbia University, New York University), not-for-profit educational foundations, and community-based organizations.

It is within this context of governance and policy changes that the NYCDOE, with financial support from private foundations, launched its education reform agenda in 2005, which includes the following initiatives:

1. Support new pathways to graduation, work, and post-secondary education.
2. Support new small schools and develop small learning communities within existing schools.
3. Implement the Selective Schools Initiative to increase the range of quality small-school choices available to families living in traditionally underserved communities across the city. The new selective schools are much smaller than the four traditional selective schools that already exist (e.g., Bronx Science, Brooklyn Tech). "They offer students a more personalized learning environment, allowing for greater one-on-one interaction between teachers and students, access to state-of-the-art facilities, opportunities to delve deeply into fields of study, and a wide-range of challenging coursework" (NYCDOE, 2009, p. 1). In applying to the new selective schools, students are given the options tocan showpresent their -prior academic performance and/or demonstrate their interest in learning. As of April 2009, the four existing selective schools have recruited and enrolled a diverse array of talented students who reflect the ethnic diversity of New York City.

The NYCDOE launched the Selective Schools Initiative, a public-private partnership, in 2005. The goal of the initiative is to expand the pool of options for academically gifted students by 2011, while also reaching more students in economically disadvantaged families. The plan of the NYCDOE is to open seven new schools between 2005 and 2011. As of July 2009, four schools are operational, one school (The Cinema School) is opening in September 2009, and the remaining two schools are in the planning stages. The current study focuses specifically on the iSchool, which opened in 2008. In the text below, we use interchangeably terms like "new-model school," "innovation school," "21st-century school," "21st-century education systems," "next-generation school," and "next-generation education systems" to refer to the iSchool or similar schools or education systems.

The Current Study

Cisco asked researchers at Education Development Center, Inc. (EDC), a not-for-profit education organization (www.edc.org), to identify the lessons learned from the implementation of the iSchool in New York City and to translate these lessons into actionable thematic areas for education leaders and decision-makers involved in implementing and scaling up education reform efforts. Drawing from the successes and challenges experienced at the iSchool, the research team aims to inform the development of a replicable model for transforming schools into 21st-century education systems.

Study Design

EDC researchers employed a rapid ethnography to facilitate the process of data collection, presentation, and analysis (Holtzblatt & Jones, 1992; Hughes, King, Rodden, & Andersen, 1995; Millen, 2000). This methodological approach included four primary components:

Participants

The first component of the research involved individual interviews with key participants involved in the planning and implementation of the iSchool. In total, 11 interviews were conducted. Participants included the following:

- Leaders from the iSchool
- Members of the NYCDOE, including individuals from the New Schools Office, the Office of Portfolio Planning, and the Division of Information and Instructional Technology (DIIT)
- A representative of the Fund for Public Schools
- Cisco staff members

Interview Protocol and Analysis

EDC researchers developed an interview protocol to identify the successes, challenges, and lessons learned (see Appendix). Specific questions asked participants to reflect on the innovative aspects of the iSchool, education problems that the development team sought to address, changes to the initial design, financing, partnerships, and the impacts of innovation on teaching and learning. Additionally, questions tapped participants' perceptions of the sustainability of the iSchool as an innovation. Interviews lasted two hours and were audio recorded for transcription and analysis.

Using a grounded theory approach (Strauss & Corbin, 1990),[4] EDC researchers coded interview transcripts to identify central themes and lessons learned about the planning and implementation of key innovative education processes and programs.

Document Review and Analysis

The study involved a review and analysis of relevant documentation on the planning and implementation of the iSchool, as well as broader efforts within New York City to transform schools into innovative systems. Interview participants provided documents to the EDC research team. Additionally, EDC researchers conducted a search of Web-based and print media to find information and press coverage about the iSchool.

Researchers analyzed the documents to better situate the innovation within the context of broader transformation efforts. Moreover, the documentation review was intended to further explain findings emerging from interviews with research participants.

Education 3.0 Leading Indicators Preliminary Diagnostic Tool

Researchers gave each iSchool co-leader the Education 3.0 Leading Indicators Preliminary Diagnostic Tool to complete and return to the researchers. This self-assessment tool, designed by Cisco Global Education Group, is meant to provide an overview of where a system—a school or a district—stands in relation to what Cisco has defined as Education 3.0 ideals. The set of leading indicators targets four main areas of education, including Curriculum and Pedagogy; Leadership, People, and Culture; High-Quality Infrastructure and Technology; and Adapted System Reform.

The self-assessment process is meant to promote reflection among educators on the nature of 3.0 education and the values and priorities of their communities. The resulting information is intended to inform strategic planning and resource allocation decisions for impacting student learning. For this research project, the data will be analyzed and used to better understand what components of the iSchool make it a unique system.

[4] Grounded theory is a systematic ethnographic research methodology used to generate theories from qualitative data in the process of conducting research.

Study Site

The iSchool opened its doors in September 2008 to a class of 100 ninth-grade students. Located in District 2 in lower Manhattan, the school will add approximately 110 students each year until it reaches its capacity of about 450 students, serving grades 9–12. The student body is 80 percent minority (primarily African American and Hispanic, with a small number of Asian students). Students come from all five boroughs of New York City and are considered for admission after completing an "Online Questionnaire Activity." First-year staff included two co-leaders, five full-time teachers, four part-time teachers, one guidance counselor, one part-time field work coordinator, one technology coordinator, one full-time computer technician, and one office manager.

The iSchool was designed to integrate challenge-based and interdisciplinary learning strategies with state-of-the-art information technology infrastructure and tools as critical components of the overall educational experience. The hope is that the school's success at incorporating technology into everyday learning will serve as a model for the development of other schools in New York City.

NEW YORK CITY iSCHOOL:

A Next-Generation Education System

The findings presented in this section are drawn from the experiences of the iSchool staff's efforts over the last two years. EDC researchers have identified eight key factors in the successful implementation of the iSchool that are worth consideration in launching a similar next-generation school. The critical elements include (1) setting the stage for innovation, (2) selecting and supporting leadership, (3) supporting teaching and learning, (4) implementing technology, (5) creating a supportive learning environment, (6) building partnerships, (7) developing a sustainability plan, and (8) creating a replicable new-model school.

Setting the Stage for Innovation

To set the stage for the implementation of the NYC iSchool, two complex sets of operation strategies were put in place: (1) secure high-level support and sponsorship with the education system, and (2) set up a rigorous process of selecting strong leaders for the innovation.

High-Level Support and Sponsorship Within the Education System

From its conception, the iSchool benefited from funding and strategic support from public-private partnerships. The NYCDOE provided the typical amount allotted to new schools with the iSchool's expected enrollment numbers. Additional donations came from outside funders, including Mortimer B. Zuckerman, co-chair of the Funds for Public Schools, who donated $1 million to the initiative to finance the base technologies and the infrastructure development. Cisco is providing non-directed cash grants, in-kind services, and access to national educational technology experts to advise on trends and innovation in education.

The New York City school chancellor, the NYCDOE's chief information officer, the former chief of the Office of Portfolio Development, and other leaders throughout the New York City school system lent robust support for the design and implementation of the iSchool. Participants in the study told researchers that 21st-century schools like the iSchool need such high-level support to get started, ensure follow-through, and help maneuver within a large system with associated bureaucracies (i.e., facilities and other systems that are not set up to work effectively with schools that work "outside the box"). Without this help, changes in high-level funding or school-level leadership requirements may conflict with the goals and vision of the school. Further, high-level leaders also promote broader awareness of the school and its mission, which helps attract new partners and stimulate community enthusiasm. To sustain interest and support, iSchool leaders were careful to maintain consistent contact with the chancellor and other leaders in the district office, sharing news of the school's innovations and successes throughout the design and implementation processes.

The iSchool had other champions within the NYCDOE as well. Individuals in the Division of Instructional and Information Technology (DIIT) served as liaisons between the partners and the school's co-leaders, technology personnel, and other staff, and helped ensure that partners and staff members followed through on their promises and responsibilities. These individuals had knowledge of both the infrastructure and instructional aspects of technology integration and could communicate the school's vision and needs to the various groups involved in the implementation. Participants in the study told researchers that engaging the NYCDOE in an ongoing dialog was a necessary component to building a successful new school.

The support of NYCDOE administrators is vital to help push pieces of the implementation plan through. Administrators at the central office who buy into a project are more willing to return phone calls and complete paperwork. At the iSchool, one of the co-leaders had worked at the NYCDOE and therefore knew whom she needed to call to complete a task or get a project's approval. Although that situation is unique, developing and maintaining positive working relationships with people at the central office is nonetheless key.

Selection of School Leadership

When asked to choose the most important components of an education innovation, every participant in the study identified leadership as the most influential. The NYCDOE and the project's sponsors (e.g., Mortimer B. Zuckerman, Cisco) sought a large group of applicants and conducted a rigorous selection process. Study participants' insights about the strength of the iSchool leaders suggest that they were hired to lead because of the following characteristics:

- Have a clear education and technology vision
- Have abilities to communicate vision effectively
- Are able to learn from struggling as well as innovative schools
- Have a realistic implementation approach
- Are comfortable delegating critical tasks to colleagues
- Are strategic in their management style

Leadership

Co-leadership was not the original plan, but these individuals complemented each other well and had a history of working together at a public middle school in New York City. At their previous school and at the iSchool, one leader would work directly with partners and communicate the school's vision, and the other would lead professional development and instructional efforts. In addition to attending to the school's operational and instructional needs, the co-leaders' shared vision of what an innovation school should look like aligned with the NYCDOE's reform agenda.

Has a Clear Vision

Participants in the study believed that leaders must crystallize their vision as early as possible in the school planning phase, articulating how students will learn and communicate, how teachers will approach instruction, and how the physical environment will foster the desired culture and patterns of interaction. The iSchool co-leaders had a vision from the outset. Central to this vision were interdisciplinary, challenge-based learning, and individualized instruction, situated within a developmentally appropriate, college preparatory focusBuilt within a developmentally appropriate and college preparatory focus, this vision as. Additionally, the co-leaders envisioned ubiquitous technology access to afford students the freedom to work in their own time and at their own pace.

Communicates Vision Effectively

A clearly articulated vision for an innovation school is only valuable if it is understood and embraced throughout the system. At the iSchool, the co-leaders engage in ongoing discussions with teachers and other staff members about the goals of the school and the importance of the vision. Participants told researchers that everybody at the iSchool is able to clearly describe the school's mission. A staff that understands, buys into, and feels part of the school's vision is more likely to embrace practices that are aligned with it.

Outside of the system, effective communication about the vision helps get funders, partners, parents, students, and other community members on board with the concept of the school. iSchool co-leaders conveyed their vision for the school through brochures and a school website that described the school's culture and innovative approaches to teaching and learning. These resources facilitated fundraising and communication with parents and the community because they informed stakeholders about the school, how it is different from other high schools, and why the leaders feel this is the way schools should approach education going forward.

Learns from Other School Models

The creators of the iSchool felt it was critical to identify and learn from successful models to inform their own planning. The iSchool co-leaders visited schools across the East Coast that were doing innovative work in interdisciplinary, project-based learning and with physical and technological infrastructure.[5] They also engaged in dialog with school leaders virtually (e.g., High Tech High in California) and face to face at conferences. These experiences helped them refine their vision and crystallize how to ground it in everyday approaches to learning and instruction.

Learning from schools that are struggling is as important as learning from successful schools. The co-leaders at the iSchool found that struggling schools often lacked a clear vision or had a vision that was not managed effectively. They also thought that high schools tend to fall into one of two groups. One group chooses to ignore standardized exams in favor of promoting high-level thinking skills and innovative coursework. Although this provides a valuable learning experience, students in these schools often fall short of achieving state graduation requirements because they do not develop test-taking skills. The other type of school, in contrast, focuses almost exclusively on preparing students for standardized exams. Their students often graduate and, as one participant put it, "know a lot of random facts about a lot of random things," but they do not develop the critical thinking or study skills needed for college. At the iSchool, the leaders chose to tackle both priorities. Finally, the leaders' visits to underperforming schools, particularly those in beautiful networked buildings, reinforced their belief that innovation is not driven by state-of-the-art facilities or cutting-edge technologies, but rather by a strong vision and a commitment and carefully designed, cutting-edge pedagogy.

Has a Realistic Implementation Approach

An implementation plan addressing support mechanisms as well as short- and long-term outputs with specific steps to achieving them is key in guiding a new school's development over the first few years. This implementation plan must be thoughtfully constructed and meticulously laid out, and rooted in the school vision but flexible enough to withstand the battery of challenges that are bound to arise.

Having started a new school at another location, the co-leaders knew the basics of what needed to be done in Year 1. They started the implementation of instruction and technology resources using two approaches. One of the co-leaders explained, "While we were comfortable instruction-wise with a long-term plan, we were deliberate in not planning too far in advance technology-wise." The plan focused primarily on student structures, culture-building, and curriculum. Planning for the technology was much more open and flexible than their instructional planning processes for several reasons: They did not want to be overwhelmed with technology implementation issues in the first year; they wanted to remain on the cutting edge of technology but proceed cautiously (i.e., they needed to understand

[5] The School of the Future in Philadelphia, TechBoston, and Charles County Public Schools in Maryland were among the school visited.

their options more thoroughly); they needed to align the rate of technology acquisition with teacher readiness. As a result, the adoption of a flexible technology plan allows them to acquire more technology as they learn more about it.

In addition, the co-leaders had two important suggestions to guide the creation of an implementation plan. First, leaders must anticipate that dramatic changes to the plan will be necessary and build in opportunities to reflect, codify, and implement the needed changes without causing alarm within and outside the system. At the beginning of the school year, the iSchool leaders announced that the school schedule would change every nine weeks. This allowed other changes to be implemented with little pushback from parents or district administrators.

The co-leaders also emphasized the need to be realistic about what could be accomplished in the first school year. For example, iSchool leaders decided that offering foreign language courses would be an overtaxing enterprise in light of their other "mission-critical" curriculum goals. For this reason, they decided to wait until subsequent years to offer these types of classes. Creating a list of projects, courses, and problems to address in the future helped leaders prioritize and remain focused on meeting their more immediate and pressing goals.

Leads by Influence and Delegates Appropriately

In the planning and initial implementation phase of an innovation school, it is critical for the leadership to acknowledge the enormity of the undertaking and relinquish the traditional idea of command and control, adopting a more collaborative leadership approach. The iSchool is built on a leadership model in which the two directors share all management responsibilities and meet with staff members frequently to delegate tasks and communicate responsibilities. Ongoing dialog results in a mutual understanding throughout the system; participants told researchers that everybody at the iSchool—teachers, technology personnel, the office manager, the guidance counselor—understands his or her role, feels responsible for keeping the school operational, and helps make sure that nothing falls through the cracks.

Manages Strategically

To manage strategically the planning and implementation of a new-model school, leaders must strike a balance between encouraging experimentation and ensuring that innovation does not run rampant and undermine the vision and reform agenda. The co-leaders at the iSchool achieved this balance by reflecting deeply about the critical relationship between their innovation efforts and the school's vision. Their "mission-critical" innovations included creating an interdisciplinary challenge-based curriculum, providing ongoing professional development, providing access to advanced technology infrastructure and tools, and providing access to a socially rich, collaborative, and physically flexible learning environment. The iSchool leaders deemed worthy the extensive time and resources they put in to maintain total focus on this balance. The estimated 100 hours of work to develop an interdisciplinary learning module, for example, was time well spent because it promoted the instructional approaches that are central to their vision. Working with staff, the leaders made sure to develop modules that could be used in future years; they did not invest the same effort in programs they considered "one-offs."

Leaders also must minimize the risks of innovation so they do not threaten the stability and efficiency of essential school operations. One method of achieving this is to establish an environment in which innovative ideas may be piloted. Successful innovations may then systematically be integrated into broader school processes. The iSchool leaders have included the willingness to take pedagogical risks as part of the interview process for new faculty at the iSchool, and they plan to create an Innovation Lab where teachers and students can explore new ways of using new technology tools, which will allow the leaders to safely encourage innovation in all aspects of teaching and learning.

Teaching and Learning

iSchool leaders found that a shared vision was essential for all the school's stakeholders—including teachers. Those who already embraced the vision for the school and were willing to push it forward fared better than teachers whose beliefs conflicted with what the leaders were trying to do. When recruiting teachers for the second year of the program, leaders made sure to be very explicit about the school's vision and pedagogy. In addition, they implemented a more rigorous and structured interview process in which candidates visited the school for two-hour sessions and did 15-minute rotations with a variety of staff members. The staff members asked candidates about different aspects of their teaching practices and their receptivity to the approaches embraced at the school (e.g., a constructive approach to teaching and learning).

iSchool leaders realized they needed to clearly articulate the school's vision and pedagogical approach for potential students and their parents as well as potential staff. Second-year applicants' desire to participate in the school's vision was as important as their test scores and grades. Participants told researchers that students who were most successful in their previous schooling were the most resistant to the iSchool's teaching practices, preferring textbooks and lectures to the school's interdisciplinary, project-based approach. In addition, many parents did not trust the new pedagogical methods, and some threatened to pull their children from the school until they realized that students were actually excelling on traditional and non-traditional assessments.

The iSchool employs many approaches to improve teaching and learning every day. The teaching concentrates on students' skills, and social and emotional development needs. The curriculum is teacher-created, interdisciplinary, and focused on solving real-world problems. Learning is individualized and, not only prepares students for college, but also for the workplace through collaborations with community and business leaders. Ultimately, students take ownership of their work and are expected to monitor their own progress. Block scheduling allows for team teaching and longer-term projects and activities.

Pedagogy

Teacher pedagogy is a defining element of any school, but at the iSchool it is more than what happens in the classroom—it is the school's epicenter for innovation. According to one study participant, the leaders at the iSchool are "turning what high school is about upside-down." The iSchool aims to break down the rigid, content-based structure that is traditional, in which one teacher lectures to a room full of students, and strives instead to promote collaboration among students and develop authentic problem-solving skills. Skills rather than

content drive the iSchool's pedagogy, which is a departure from the mass production model of education. In turn, the pedagogy cultivates students' social and emotional development as much as their content knowledge.

Individualized Learning and Student Ownership

The iSchool instructional approach does not require all students to learn the same content in the same order or at the same pace, but rather enables students to progress at their own pace, regardless of where they begin or how they learn. Students work in a learning environment that is customized according to their particular strengths and weaknesses. Students' individual skills and interests will guide the interdisciplinary modules they choose to explore, the roles they adopt in their project work, the information they research, and where they are placed for their Field Experience. Furthermore, the environment is developmentally appropriate for different stages of adolescence.

iSchool students develop the tools and skills they need to conduct their work and be able to advocate for themselves. If they miss a class, they are responsible for making up the work because they can access all classes online. At the end of a semester, students present progress reports to their parents and adviser and discuss their accomplishments for that quarter. As a 21st-century learning environment, the iSchool "cultivates a willingness to engage" and pushes young people to think and question.

Teacher-Generated Curriculum

The co-leaders are strong believers in teacher-developed materials, reasoning that curricula, instructional tools, and content must be uniquely tailored to their specific vision and pedagogical goals. Working as a group, the staff developed a curriculum that encourages cross-disciplinary collaboration and problem solving. This curriculum comes in the form of nine-week modules, each of which is developed around a particular theme or task. In the first year, the staff designed and implemented four interdisciplinary, nine-week modules: The Psychology and Neuroscience of Learning, Voices and Memories; Memorializing a Collective Legacy of Trauma (in collaboration with the National September 11 Memorial and Museum [9/11 Museum]); Climate Change; and Call to Action: Crisis in Zimbabwe (focused on the development of digital activism campaigns).

Although building a curriculum from the ground up was a daunting task—the teaching staff would meet for hours at a time to construct a single well-rounded module—they found it necessary in order to push their vision forward. Over time they learned how to streamline the process without sacrificing the quality of the programs. In preparation for the school's second year, the entire staff brainstormed ideas for modules and then each staff member chose a topic for which he or she would lead the development. The lead teacher began by incorporating what he or she knew about the subject and then passed the curriculum to another teacher to help fill in the gaps. This method decreased production time and allowed teachers to focus on a topic in which they were most interested and knowledgeable.

Interdisciplinary Learning

Interdisciplinary learning at the iSchool happens in both the use of modules and core courses, for example, an American humanities course that approaches U.S. history through literature, art, and music. Students still study traditional subjects, such as social studies, science, and English language arts. Although mathematics is not always fully incorporated into the course modules (because school leaders feel its inclusion would often feel forced), math classes still focus on problem solving and real-world issues.

Block Scheduling

Instead of the traditional 50-minute period, the school runs on a block schedule where classes are combined into longer chunks of time and integrate an interdisciplinary approach. Learning within these blocks is not compartmentalized; in one block session, students are asked to tap multiple skills in multiple disciplines as they work toward the understanding of authentic topics.

Real-World, Challenge-Based Learning

Schools that focus on real-world problem solving promote the development of a skill set that is well-suited for college and the working world. One of the tenets of the iSchool is that students do not learn subjects in isolated silos, but rather in the contexts in which they will use these subjects. To this end, the iSchool leaders recruit the participation of a wide range of experts, including academics, authors, entrepreneurs, small-business owners, and diplomats. During the nine-week modules, these real-world practitioners pose issues and problems that are relevant to their work, and visit the school or invite students to their work environments to learn firsthand about issues they handle every day. This approach not only helps students understand how the subjects they are learning impact the real world, but also how the real world impacts what they are learning. Ultimately, the leaders intend to develop a "catalogue" of problems that students can access and work on at their own pace.

At the iSchool, projects involving the 9/11 Museum and the New-York Historical Society helped prepare students for work beyond the high school classroom. With the 9/11 Museum, students conducted videoconferences with other youth from around the world to learn about their reaction to the terrorist attacks. After compiling the video recordings, the iSchool students presented their work to the 9/11 Museum staff, who accepted this project as part of an exhibit. Students also worked with the Historical Society and Public Broadcasting Service to help create a website that will provide information for young visitors to New York City. By working on these projects, students develop knowledge relating to (but certainly not limited to) web design, history, and cross-cultural communication. The focus on 21st-century skills such as problem solving, collaboration, communication, time management, and self-management, rather than short-term outcomes like passing a course or writing a paper, prepares students for the world outside of a school setting. Students must also partake in a weekly internship in a field of their interest.

College and Work Preparation Skills

In preparation for college, students must learn to manage their study habits. Students develop this skill—in addition to skills in time management, note-taking, and project management—at the iSchool through the curriculum, supported by discussions with advisory groups and, when necessary, one-on-one sessions with teachers and the co-leaders. Students' ongoing discussions with teachers and school leaders also emphasize and promote epistemological awareness—knowing when one knows something and recognizing what it means to be an expert.

Physical Space

Organizing the physical space to support the educational vision is important, although this is often difficult to accomplish in existing schools. Classrooms in the iSchool's turn-of-the-century building, for instance, were designed for rows of chairs rather than larger tables that would foster group work and collaboration. iSchool leaders met this challenge by converting the original space into a college-like environment with these key features: technology access, ubiquitous access, and a flexible and inviting physical environment. They turned the gymnasium into a "Creative Commons" group workspace, complete with a suite of technology tools that included large screens for videoconferencing, desktops with large monitors for student collaboration, printers, a Smart Board, Interwrite pads, and a student response system. The design of the physical spaces afforded small- and large-group discussion and collaboration. Students can use the space for individual purposes, for example, to relax and catch up on their work. Such space fosters students' abilities to manage their own time and engage in meaningful learning, and thus, helps reinforce a culture of trust and independence.

Assessment

Standard methods of assessment do not measure problem solving, critical thinking, communication, and technology skills; alternative methods of assessment are necessary. iSchool teachers evaluate student contributions to group work by reviewing individual progress logs or peer evaluations. Online discussion forums allow teachers to see when and how students contribute to projects. When students' efforts are unclear, iSchool teachers pose targeted questions that reveal students' knowledge of the work that the group created.

Although the focus is on collaboration and challenge-based work, the need remains to prepare students for the New York State Regents exams. The iSchool sets aside time each day for students to take online courses that prepare them for these exams. Because the courses and practice tests are Web-based, teachers are able to track students' progress toward competency. Tracking also allows teachers to provide just-in-time support when they see students falling behind. Teachers felt that the self-paced, online courses and a seminar on test-specific sophistication prepare students efficiently for the standardized tests, thereby reserving more time for the interdisciplinary, challenge-based work that is aligned with their school vision.

Assessment results suggest that the iSchool is succeeding in its dual goals of preparing students for the Regents exams and promoting critical life skills. Using the self-paced, self-directed Regents preparation course, many students completed the math curriculum in just a few months. Additionally, a quarter of the ninth-grade students passed the Regents exam in global studies or living environment in January 2009—months earlier than when most high school students had even completed the course.

Study participants' discussions with students and reviews of progress logs also suggest that students are attaining key 21st-century skills. When answering questions about their work, students did not talk about how many errors they had made on a test or what their grade was; rather, they responded with complex insights into what they had learned and how it relates to real-world problems.

Professional Development

Critical to the success of the iSchool is teacher training. Professional development activities are a major human capital investment at the iSchool, and a large part of the iSchool budget is dedicated to supporting this. Attending five hours of professional development per week is the expectation. The iSchool offers professional development activities on Wednesday afternoons and one-to-one professional development discussions of classroom practice and curriculum development at least one to two hours each week. These activities are in addition to other designated professional development days that are systemwide. With occasional exceptions, training takes place on-site with a co-leader directing most sessions.

Participants in the study criticized programs that instruct teachers on the use of a particular tool that is not available in their classrooms. Having school staff offer professional development in-house helps ensure that training is relevant to the curriculum and resources available to teachers. Leaders at the iSchool also make sure that training sessions are individualized by addressing specific issues that teachers confront or specific instructional practices they hope to implement. During frequent one-on-one sessions with teachers, iSchool leaders provide feedback on lesson plans or classroom observations. Training, thus, is administered "as needed" in the context of what teachers are doing. Furthermore, because the training is "just-in-time," teachers understand its importance and can see the immediate applicability to their work.

Teacher Challenges and Extra Support

Even with a careful and rigorous hiring process, it is critical to provide extra support to teachers in the planning phase of the innovation. Several teachers needed time and extra training to adjust to the iSchool's new processes and protocols. Mid-career teachers had trouble using the technology, whereas newer teachers who were comfortable with the technology tended to struggle with classroom management. Across all experience levels, the new role teachers were asked to adopt—serving as facilitators rather than lecturers—posed difficulties. The interdisciplinary nature of the curriculum also presented challenges; teachers struggled with focusing daily instruction on the challenges and big ideas, and less on the content being tested. Finally, building online courses through a management system (e.g., Moodle) was a significant challenge regardless of teaching experience.

To help teachers overcome technology resistance and fear during the development process of online courses, the iSchool worked with a technology integration consultant and the two in-house technology staff: a technician and a technology integration specialist. As the in-house technology specialists provided ongoing technical and technology integration assistance, the consultant spent approximately 10 percent of his time per month at the school assisting teachers one on one in their efforts to integrate technology into their instruction and improve their teaching practices (see the Technology Support section below for more details). Teachers needed a full semester to become comfortable with the technology tools and new teaching model.

After the first semester, most teachers reported a notable drop in stress level. A few, however, remained doubtful that the new approaches to teaching and learning were superior to more traditional pedagogical methods. After seeing the results of their efforts, as well as students' high scores on the Regents exams, the leaders were confident that even the most resistant teachers were on board and would enter the second year with enthusiastic support for their innovative approaches.

Technology Implementation

iSchool co-leaders and their partners at the NYCDOE developed a technology plan that was deliberately and closely tied to the teaching and learning goals they hoped to accomplish in the classroom. As a result, technology is embedded in everything students and teachers do; it is used to complement instructional goals by helping teachers teach and students learn, but it is never used unnecessarily or to replace a live instructor. Technology allows for collaboration among students and teachers as well as across the two groups. iSchool teachers also used an education management system (e.g., Moodle) to construct, store, and implement their lesson plans.

Technology Access

Knowing what technology is needed, how frequently it will be accessed, and how it will be used is a critical step in the technology implementation phase of a new school. Leaders must then select the appropriate hardware and software and distribute the technology systematically and thoughtfully throughout the building. Aligning these two steps with the vision is vital to accomplishing the school's goals. The iSchool leaders achieved their goal of establishing a "100 percent wireless footprint" so that students and staff could enjoy ubiquitous access in all classrooms, common spaces, hallways, and offices. They also knew they wanted a one-to-one ratio of student to computing device (this is different from a one-to-one laptop school, in which each student is assigned a specific computer). Students and teachers at the iSchool have unlimited access to the technology they need as a result of this careful planning.

Technology and Learning

Among the principle affordances of unbridled technology is giving teachers and students the freedom to customize teaching and learning to their own needs. With the availability of online courses and immediate access to experts outside of the classroom, iSchool students have more freedom to learn in their own time, at their own pace, and in accordance with their own interests. The school leaders are careful, however, to avoid pushing technology use too far; ultimately, they found that a blend of online and offline approaches creates a rich and constructive learning environment that supports the broadest range of learning modalities.

The availability of technology also helps close the expertise gap among teachers. Leaders are able to offer more honors, Advanced Placement, extracurricular, and core courses online without hiring additional staff members. For example, when some students accelerated through the ninth-grade mathematics curriculum in a short time, iSchool leaders faced the

unanticipated need to teach geometry mid-year. The school did not have a qualified geometry teacher, so it hired a teacher to instruct from a distance via a virtual meeting and collaboration environment and an interactive whiteboard. In a similar manner, experts frequently "visit" the classroom virtually through videoconferencing and online discussion forums.

iSchool staff found that online classes can lack the human touch and run the risk of boring or disengaging students. New York State, however, requires that a teacher be physically present at all times—even for an online class—which helps keep students calm, engaged, and on task. The iSchool staff also found that students needed to learn how to be successful online learners. During an online lesson at the iSchool, the on-site instructor answers questions and helps those who are struggling.

Technology Support

Leaders of the iSchool were adamant that full-time, on-site technical support was critical to the successful integration of technology. Educators and students cannot fully integrate technology into their teaching and learning if they must wait days, or even weeks, for repairs when something breaks down. In addition, teachers need ongoing support to help them quickly integrate new technologies into their practice. Therefore, the iSchool hired a full-time technician and a full-time technology integration specialist; both positions were funded within the NYCDOE budget limitations. While the technician focuses on equipment maintenance and ensures that the technology does not disrupt teaching and learning, the integrationist attends classes and helps teachers effectively integrate the tools and software into their lesson plans.

In addition to these staff members, the iSchool also worked with a technology integration consultant at the beginning of the school year. The consultant led professional development sessions to help teachers evaluate the effectiveness of what they were doing with technology in their classes. He also gave suggestions on improving their teaching methods.

As it enables the successful implementation of the vision, technology becomes more mission-critical and thus requires leaders to provide for more maintenance support with an adequate and qualified staff (e.g., chief technology officer, technician) and to develop long-term technology sustainability plans. If technology resources conflict with the school's vision, they will distract from the teacher and student experience.

Technology Challenges

Technology implementation in school settings is never an easy undertaking, and the iSchool had its share of challenges. The school bought a set of handheld devices to substitute for computers, but they did not perform as expected and students made it clear that they preferred laptops. The school's videoconferencing system also was riddled with glitches and required frequent technical support. A Virtual Desktop Interface (VDI), which was purchased to allow students and teachers to access their work anytime and anywhere as long they were connected to the Internet, presented several challenges as well. The system was introduced to teachers and students mid-year, when students were already in the habit of using flash drives, so they did not immediately integrate it into their work. Because students

had had negative experiences with technology in school in the past, they did not trust this new system, and a lack of off-site technical support hampered at-home access to the system. As a result, school leaders had difficulties getting the students to use the VDI system. To address this particular problem in the next school year, iSchool leaders plan to introduce the technology to users at the beginning of the year and have contracted for 24/7 bilingual VDI technical support.

When making large investments in technology, it is important to obtain buy-in at both the school and the central office. The iSchool purchased most technologies with external funds, so there was little incentive at the NYCDOE to ensure that careful research informed these acquisitions. The school may need the NYCDOE to help maintain the infrastructure in future years, however. Additionally, the NYCDOE may decide to centralize some of the technology resources to benefit other schools and to distribute the cost across many schools. Finally, NYCDOE involvement in technology decisions helps ensure accountability at all levels of the system. To promote the NYCDOE's involvement in these matters, school leaders should seek co-funding for technology investments.

An unanticipated challenge relating to technology implementation came from students' reaction to the iSchool's integration efforts. Leaders and teachers found that they often overestimated students' desire to use technology in all aspects of their school experience. As mentioned earlier, one example was students' resistance to the VDI. Students also had fewer IT skills than the leaders anticipated, and some students argued it was easier and preferable to sit through a traditional lecture than engage in interdisciplinary projects or online work. Because students complained of headaches from staring at the screen so much, the school scaled back its initial technology push and began offering students print as well as online resources. Before jumping to conclusions about what students want, it is important for educators to listen to students and make informed choices about how to maximize technology's positive impact on learning.

Culture

Pedagogical goals and approaches, staff expertise, technology integration, and the ways in which student achievement is evaluated all strongly influence the culture of a school. iSchool staff found the following three factors to be critical in promoting their vision.

Active Learning and Student Engagement

An important aspect of a 21st-century school's culture is the ability for students to adopt an active role in their own learning. Educators at the iSchool promote active learning in a variety of ways; these include allowing students to choose from a number of interdisciplinary modules, learn and work at their own pace, pursue their own interests by choosing which lead role to take on in projects—such as creating a PowerPoint presentation, conducting research, or summarizing the group's results—and extend their learning beyond the school building by participating in an internship program.

Freedom and Mutual Respect

Mutual respect throughout the system is a building block of a facilitative culture. At the staff level, new ideas are encouraged and welcomed in order for the school to grow in positive ways. Teachers and leadership meet weekly to share thoughts on curriculum plans. The open environment facilitates idea generation and team problem solving, and differences of opinion are the subjects of thoughtful discussion rather than tension within the staff.

A culture of respect among staff carries over to their relationships with students. iSchool teachers and leaders question conventional conceptions of what high school students are capable of. Adolescents are commonly thought to be hormonal, adrift, immature, troubled, peer- and self-obsessed individuals. Ideas like these help maintain the assumption that students cannot be expected to do sustained or critical thinking. Leaders and teachers at the iSchool acknowledge that there is a great deal of variability from one adolescent to another. More significantly, they recognize that high school students can and should be the subjects of high expectations and that at adolescence, learners are particularly ready to develop the complex thinking skills that next-generation education systems aim to promote. The iSchool engages students in multifaceted problems that have immediate implications for their community and the world. Students have access to expensive technology

equipment and tools and are trusted to handle them with care. They are also allowed to use cell phone tools and MP3 players as long as these do not distract from learning or disturb other students. Students respond well to these freedoms; study participants consistently described the iSchool as a calming, active, respectful environment—free of the "four-letter words" and "repulsive gestures" that one may witness in other high schools.

Involved Leadership

In light of the importance of effective leadership in an innovation school environment, leaders must be in touch with what is going on in their halls and classrooms. Principals who are locked in an office all day are unable to implement their vision and unprepared to address the challenges that arise. iSchool leaders' offices are connected to the student commons, which is the busiest and most social area of the school. From their offices, leaders can see everything that goes on. Throughout the day, the leaders emerge to join group discussions, strike up conversations with students who are working independently or on collaborative projects, and even teach classes. In addition, the leaders serve as student advisers.

In most schools, students go to the principal's office only when they have committed an offense. Participants told researchers that iSchool students lined up at the leaders' offices to discuss internships, coursework, or other school issues. The warm relationship between students and leaders was largely due to the leaders' attention to what students understand and care about. For example, they recognized that video games, social networking, and online environments such as Second Life captivate the interest of many students and considered the implications of those tools for learning. Although they did not integrate those interests into instruction all the time, their acknowledgment of what students care about went a long way toward nurturing respectful interactions and a caring environment.

Partnerships

Those who participated in the implementation of the iSchool assert that schools are incapable of becoming 21st-century systems without establishing external partnerships. Partners may help with any aspect of school planning, including issues related to technology, curriculum design, or professional development. They are particularly important for filling knowledge gaps that may exist in the system. As one participant put it, "It's sort of like forming a band, right? You need the drummer, you need the guitar player, you need somebody to do the vocals, and everybody has a role, right, and they all fill a gap." Partners may help leaders think through issues that arise or improve their processes. Furthermore, partners can promote innovation by funding pilot initiatives.

Corporate partners can make students aware of businesses in their community and what real jobs are like within these organizations. Through work with partners, students gain experience applying the knowledge they learn in school to real-world contexts that benefit businesses, their local community, or society as a whole.

Finally, funding from external partners often bolsters commitment to the project among high-level stakeholders such as the chancellor and the NYCDOE.

A shared vision was as important in establishing successful partnerships as in every other aspect of the school. Successful partners came to the table as stakeholders and worked with the leaders to establish a plan in which all parties benefited. A system of checks and balances prevented one partner's motivations from undercutting those of other stakeholders. In addition, stakeholders in the iSchool learned that partners must be explicit about their own goals, and leaders and other school staff must acknowledge those goals.

External partnerships are not to be undertaken lightly. Even the most successful partnerships are quite time-consuming, and because of the delicate management required, the iSchool leaders advise principals to enter only into partnerships that are critical to the mission and goals of the school.

Leaders must also be resilient to the whims of particular partners. iSchool leaders learned the hard way that they must prevent partners from steering them off-course due to differences in motivations or visions. Like many school stakeholders, partners often become attached to the model they know and are comfortable with. One iSchool partner, for example, entered the school with preconceived notions about how students access and interact

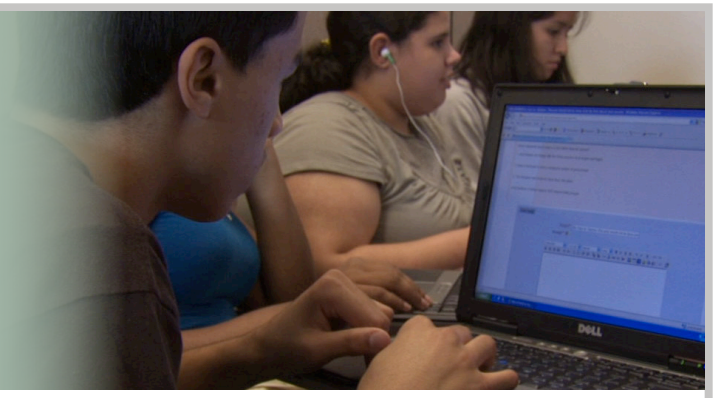
with technology. In line with these notions, this partner put forth a prescriptive agenda that included building a traditional computer lab. Because this plan conflicted with the leaders' vision for open, flexible spaces and portable devices, the leaders had to work closely with the partner to help the partner adapt to their vision. Change is difficult, and leaders should not continue relationships with partners who are unwilling to embrace their vision.

Finally, leaders must be aware that partners do not always follow through on their promises. At the iSchool, one partner did not fulfill a commitment to delivering technologies for the first day of school. To prevent such disappointments from disrupting learning and instruction, leaders must have backup plans in place.

Partners' Continued Involvement

Corporate partners will likely scale back their involvement after the first year. To prepare for this, a new school must become self-sustaining. Leaders may elicit the help of their partners as they strive for self-sufficiency. One iSchool partner said, "At the end of the day . . . we need to teach these schools that we're engaged with, these systems, how to fish. We can't do all the fishing for them." This partner will phase out of involvement slowly over three years as the iSchool develops the capacity to take over that role.

The central office's day-to-day involvement with the iSchool has decreased over the last two years as well. Initially, the iSchool met with NYCDOE members multiple times per week. These meetings became less frequent as time went on, and next year their meetings are expected to be rare. Although this transition is normal and a sign that the school is on its way to self-sufficiency, leaders should be careful to maintain some contact with the NYCDOE; the longevity of that relationship is critical if funding issues or other challenges arise.



Sustainability

Study participants identified six important priorities to help ensure the sustainability of an innovation school.

Develop a Sustainability Plan

Plans for sustainability cannot be vague, nor can they reside in the mind of a school leader; a written sustainability plan must detail the budget requirements of all known human and technology resources that will be needed from year to year. This plan must be a shared document that incorporates input from stakeholders throughout the system and should include a reserve fund for unexpected costs relating to staffing, technology infrastructure, or facilities. To create a sustainability plan, all staff members must reflect on how their initial needs have changed, as well as identify projected changes.

The iSchool leaders admit they failed to write a comprehensive sustainability plan, which has led to concern among stakeholders about whether the school will have sufficient resources to continue innovating and growing as a next-generation education system. Leaders have made strategic sustainability decisions in the following areas, however:

- Budget: The leaders have made careful decisions about spending within the constraints of a typical NYCDOE budget.
- Avoiding new-school team burnout: They are thinking strategically about how to sustain teacher energy and enthusiasm and how to make teaching at an innovative school a long-term possibility for teachers at all points of their careers.

The leaders are currently detailing a plan and remain optimistic that they are building a self-sustaining model, but it is easier and safer for leaders to do this during the school planning phase.

Prepare for Leadership Changes

The commitment of a leader is critical to the sustainability of a new-model school. Being a school leader is a demanding job, however, and burnout is always a possibility. Participants throughout the system told researchers they fear the iSchool would fall apart if either leader were to leave anytime soon. In response to this anxiety, the leaders insist they are committed to building leadership in-house to prepare for any transition that may take place. They are building capacity within current staff, are supervising multiple leadership interns each year, and are building close relationships with leadership development programs. Currently

they are working on a leadership development program and evaluate themselves on their ability to plan for their replacement. Without succession planning, leaders take the chance that a new principal will introduce a new model that imposes an entirely different vision for the school, which could have a disastrous effect on the everyday school operations and practices, as well as on the relationships among students, teachers, and administrators.

Ensure Financial Sustainability

New-school leaders must realize that funding streams from the NYCDOE and partners will likely slow down after the first year. In New York City, new-school funding from the NYCDOE drops in Year 2 and in Year 3 so that resources can be directed toward building new schools; schools are also expected to have fewer costs after the first year. Moreover, partners may reduce or discontinue their funding once school operations are up and running.

Sustaining operations beyond the first year is an expensive enterprise because the arrival of a new student cohort may require additional teachers, classroom renovations, and an expansion of the technology infrastructure, new computer equipment, and other costly purchases. iSchool stakeholders expressed concern about how the leaders will maintain their model of innovation as the school expands and funding shrinks.

The financial sustainability of a new-model school will largely depend on the financial condition of the city and the nation in general, but leaders can help the situation by aggressively pursuing funding sources past the first year and limiting their expenditures to "mission-critical" purchases.

Prepare for School Expansion and Emerging Technology Needs

The daily experience of students in 21st-century schools relies heavily on technology. As the school grows, leaders must make sure that the technology infrastructure grows with it and that technology tools are frequently replenished and upgraded.

Leaders at the iSchool took these needs into account. Although their school was initially confined to a small part of a larger building, they insisted that the early electrical work involve an upgrade to the entire structure. This will allow their network to scale to a much larger environment, which will be necessary as new student cohorts arrive. The technologies that the leaders selected, including Web-based resources such as Moodle, are also scalable so that new groups of teachers and students can use them. Without these types of considerations, it would be difficult for a next-generation school to pursue its vision as it expands.

Foster Cultural Resilience

Leaders of 21st- century schools must involve all members of the system to promote the cultural sustainability of their school. Teachers from the founding year must help the next generation of teachers adapt to the environment and buy into the school's vision. Intentionally or not, as students move on to the next grade, they will model the behaviors to be adopted by incoming students.

Efforts to sustain the culture of an innovation school must not preclude its evolution. A successful new-model school will continually evolve as its leaders, teachers, administrators, and students rethink their roles and contributions.

Pursue Student and Teacher Recruitment

It goes without saying that the growth of a school depends on a reliable, annual influx of new students and teachers. To raise awareness and facilitate student recruitment, the iSchool leaders began holding seminars for prospective students and parents in the fall of its first year. Leaders talked about the vision for the school and gave families a clear understanding of what a typical day at the iSchool looks like. Additionally, a group of student volunteers gave tours of the school to interested applicants and their families. As a result of these and other outreach efforts, about 1,500 students applied for the iSchool's 100 slots for the coming school year.

Similar recruitment efforts help to attract teachers. Conveying a clear vision to candidates and detailing the role that the school expects teachers to play in fulfilling that vision help ensure the influx of qualified and enthusiastic practitioners.

Creating a Replicable Model

With substantial funding, a clear vision, strong leaders, and a committed team, creating an innovation school is a highly feasible enterprise. The iSchool is an example of a particular design model, and the leaders have taken steps that they hope will allow other schools to benefit from its innovations.

Aspects of Replicability

Throughout efforts to implement their vision for the iSchool, the leaders put themselves in the shoes of school planners who do not have extensive funding outside of what the NYCDOE provides. From the outset, they established a rule to not build anything that would not be feasible for other principals, thereby ensuring that other school leaders could emulate their innovations.

The technologies implemented at the iSchool—including the VDI, Moodle, and IP Telephony—are scalable. The leaders invested in a central infrastructure that will allow other schools in New York City to adopt these same technologies at a lower price point.

The leaders believe the iSchool model will be as effective with lower-achieving students as it has been in its current environment with high-achieving learners. Students who are struggling academically may very well thrive in an environment that employs alternative instructional approaches and assessments. With the focus on challenge-based learning and real-world applications of knowledge, the iSchool model may help historically low-performing students develop new self-perceptions and apply themselves to coursework in new ways. Time will tell whether this model indeed functions well for a wider population of students.

Some of the conditions that contribute to the iSchool's success may be difficult to replicate, however. First, iSchool leaders control the selection of teachers and student body from the ground up. Leaders who have less say about who comes into the school may have to ramp up training and plan for working with teachers and students who are resistant to their vision for learning and instruction.

Second, whereas the iSchool was a brand new institution, school staff may perceive the introduction of such a model into an existing learning environment as an imposition or top-down mandate. Many current school leaders may be resistant to change and, as explained earlier, achieving leaders' buy-in is essential to turning a typical high school into a 21st-century system. Proponents of the new-model schools may be able to help resistant leaders

adapt components of the design so that it aligns with the existing school's culture, unique vision, and current practices, but ultimately, the principal generally has a final say on what aspects of the model to apply to his or her system.

Third, one key element for garnering leaders' buy-in to the reform agenda in New York City is the empowerment and accountability of school principals. Principals are given much more power to manage and make decisions about human resources, services, and budgets and are also held much more accountable for students' successes and failures. If reform initiatives are not centrally driven, supported, and funded, however, it is very hard to scale or replicate them.

Finally, the iSchool has had the particular attention and support of both the NYCDOE and a group of dedicated partners. Such focused attention becomes less and less feasible as an innovation scales up. If the wish is for next-generation education reform efforts to result in widespread and rapid transformation across the nation, it is necessary to develop a systematic way to help schools help one another adopt an innovative education system.

Summary of Lessons Learned

Setting the Stage for Innovation

- The importance of having a core group of committed individuals working collaboratively during the early planning stages and throughout implementation cannot be overestimated. Because buy-in at the top level of the school system often is necessary to get a school started and ensure follow-through, it is beneficial for school leaders to establish and maintain an ongoing dialog with high-level officials such as the school chancellor and members of the NYCDOE, and their sponsors.
- Developing and maintaining working relationships with people at other levels of the NYCDOE can help push pieces of implementation through more efficiently.
- School planners and decision-makers should cast their nets in the planning phase of the innovation and aggressively identify promising sources of funding. To assist schools in their fundraising efforts, the NYCDOE has set up an office to find and manage external funders.
- All stakeholders must be willing and able to communicate their goals, as well as embrace the ideas and goals of others. Most importantly, the goals of team members must be aligned with those of the school leaders.
- Leadership is fundamental in determining the direction for a school and its core instructional model, so the leadership selection process must not be rushed and the school planning team must not understate its importance.

Leadership

- The school's vision must guide all decision-making and innovation, including teacher selection, student recruitment, pedagogy, partner/vendor selection, technology selection, professional development, the layout of the physical space, curriculum development, and assessment methods.
- An implementation plan helps guide new-school development in the first few years. A well-prepared plan is rooted in the school's vision and details support mechanisms, short- and long-term outputs, and protocols for hiring, budgeting, professional development, communications, instructional technology, and learning management systems.
- A leader's first priority must be to crystallize how his or her vision will be manifest each day and consider the implications for each participant's role.

- Leaders must communicate their vision effectively inside and outside the system to get staff members, students, funders, partners, parents, and other community members on board with the concept of the school.
- Leaders can learn a great deal from the successes and challenges that exist in other schools. Seeing the new-model schools gives them concrete approaches to emulate and incorporate into their evolving vision for their school, whereas seeing schools with severe shortcomings may prevent them from falling victim to similar problems.
- School leaders must be willing and able to lead by influence and delegate tasks appropriately throughout the system and work with a well-aligned team. This change is necessary to allow leaders the time and distance to get a big-picture perspective on school processes and to address challenges that arise.
- The innovation process is complex and multifaceted and thus, can easily lead to a state of chaos, so leaders are wise to use the "mission-critical" aspects of their vision as a compass to stay focused on their education objectives. Providing space for experimentation with new instructional materials and tools can allow other school members to get involved and be more experimental without interfering with essential school processes.

Teaching and Learning

- Aligning pedagogy with the vision for the school may demand a custom-made curriculum. A curriculum that embraces 21st-century skills will likely prepare students for college and work by incorporating interdisciplinary and individualized instruction, real-world problem solving, and student ownership of learning.
- The use of block scheduling to teach in-depth interdisciplinary and problem-based courses allows students to study traditional subject areas and tap multiple skills.
- To create an authentic, challenge-based learning environment, a wide range of experts—including academics, authors, entrepreneurs, small-business owners, and diplomats—should be invited to speak with students, and students should be encouraged to participate in a weekly internship in a field of their interest.
- In preparation for college, students must develop epistemological awareness and learn to manage their own study habits and skills such as time management, note-taking, and project management.
- To promote individualized learning and student ownership of their learning, it is critical not to require all students to learn the same content in the same order or at the same pace.
- Reorganizing the physical environment in an old building to support the educational vision of a new-model school can pose challenges, but it is doable. This will require repurposing spaces such as an old gymnasium to accommodate group work and collaboration.
- In the initial implementation phase of a new-model school, teachers need adequate time to become comfortable with the technology tools and new teaching model (e.g., constructivist approach).

- Professional development should be ongoing, frequently on-site, readily applicable to classroom instruction, and tailored to the teachers' needs, the school's culture, and the resources available.
- If leaders hope to promote 21st-century skills, they must identify methods to assess the development of those skills. Technology enables teachers to track students' project work and their progress on standardized test preparation.

Technology Implementation

- The acquisition, distribution, and use of technology must be systematic and clearly tie in to the vision. When bringing technology into a school or district, it is important for leaders to identify the desired technology access, role of technology, and its affordances for learning and instruction. Methods for dealing with technology shortcomings, obtaining buy-in at the school and district level, and addressing student resistance also are important to consider.
- School leaders must do careful research before acquiring tools and software and have a backup plan if the technology falls short of its promises.
- Drawing from technology integration experts and maintaining an on-site technician as well as a technology integrationist are vital to the early implementation and ultimate sustainability of a technology-rich learning environment.
- To manage technology expectations and perceptions in the learning environment, it is critical to introduce all technologies to users at the beginning of the school year, conduct technology demonstration sessions with users, and provide access to online and telephone technical support after school hours.
- When making large investments in technology, it is important to obtain buy-in at the levels of the school and central office.
- Before jumping to conclusions about what students want, it is important for 21st-century leaders to monitor students' interactions with the technology and make informed choices about how to maximize technology's positive impact on learning.

Culture

- An ideal 21st-century school culture is fostered when a school embraces active learning and student engagement, treats students with respect, gives them freedom, and has a leadership that is involved and connected with the daily happenings of the school.
- An important aspect of a 21st-century school's culture is the ability for students to adopt an active role in their own learning.
- Leaders involved in the day-to-day implementation of the innovation and those who have adopted an open communication policy are most likely to nurture a transparent, respectful, and caring environment.

Partnerships

- To establish a successful partnership, it is important to set up a system of checks and balances to prevent one partner's motivations from undercutting those of other stakeholders, to be explicit about your goals and your partners' goals, to enter only into partnerships that are critical to your education mission and objectives, and to have a backup plan for potential partners' shortcomings.
- Leaders may elicit the help of their partners as they strive for self-sufficiency and must avoid isolating themselves from the central office during this process.

Sustainability

- Develop a written sustainability plan that details budget requirements from year to year and incorporates input from stakeholders throughout the system.
- Prepare for leadership changes by building leadership in-house and documenting knowledge that would make a transition as smooth as possible.
- Ensure financial sustainability by limiting expenditures and pursuing funding sources early and aggressively.
- Prepare for school expansion by creating a scalable technology infrastructure.
- Foster cultural resilience by involving members throughout the system. Encourage existing students to model desired behaviors for newcomers and teachers to help train new staff members. Give prospective students and teachers the information they need to evaluate whether they are appropriate fits for the school.

Creating a Replicable Model

- To ensure the replicability of a new-model school, it is critical for leaders to take the following steps:
- Adopt the small-size approach to student enrollment, allowing for a personalized learning environment and greater one-to-one interaction between teachers and students.
- Work within the budget provided by the central office, and not develop anything that would not be financially feasible.
- Purchase technologies that can easily be scaled to reduce cost and address long-term sustainability issues.
- Ensure the innovation will address the educational and development needs of both low- and high-performing students.
- Ramp up training, and establish a plan for working with teachers and students who are resistant to leaders' vision for learning and instruction.
- Help other leaders who may be resistant figure out how to adapt the design components of a new-model school into their existing school environment.

- Ensure that the central office provide principals the power to manage and make independent decisions about human resources, services, and budget, and that principals are held accountable for students' success and failures.
- Develop a systematic way to help schools help one another adopt an innovative education system.

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Appendix

Codifying Innovations: Interview Protocol New York City iSchool

1. What is innovative about the NYC iSchool?
2. What are the main educational problems in other schools that people thought would be addressed in the NYC iSchool?
3. How did the innovation get started (e.g., whose idea was it, who was involved)?
4. How were the innovative aspects of the NYC iSchool implemented and promoted?
5. What system changes have taken place at the NYC iSchool since its conception (e.g., changes due to successes, challenges, anticipated problems)?
6. What impacts have you seen with regard to learning, instruction, and leadership?
7. How has the innovation been financed?
8. What will financing look like in the future?
9. What role did partnerships play in the implementation of the innovation (what is to be learned from these partnerships and what issues need to be considered)?
10. How sustainable are the innovative elements that have been implemented throughout the system (e.g., long-term maintenance, future concerns)?
11. If you were going to give advice to people about how to develop a 21st Century school, what critical factors need to be in place or must be considered?
12. Do you have anything to add in terms of lessons learned from your experience with the NYC iSchool (please keep in mind that the goal here is to create a replicable model for the development of 21st Century schools)?