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The Value of Technology Grants in Schools: A Case Study on the Connected Initiative in an Inner City Los Angeles Primary School

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Abstract

As entities from governmental and nongovernmental sectors search for means of developing underserved localities, public-private partnerships have been built to provide education technology to primary schools. In the current neoliberal, digital age, information and communication technology (ICT) is widely perceived as a value-implicit differentiator because of the information it can access and construct for its users. To further understand the implications of public-private partnerships in ICT initiatives occurring in American elementary schools, this thesis reports a study of the initial implementation of the U.S. White House ConnectED Initiative's grant in an inner city Los Angeles school, sponsored by Apple Incorporated. Questions of actor positionality, the local school's definitions of success, the outcomes of private collaboration with the school, and pedagogical implications of ICT in question are answered through interviews of administration and teachers. Findings demonstrate that, in this case, this specific collaborative partnership and ICT is facilitating a shift in pedagogy to an individualized learning construction. Among the few early studies on the ConnectED grant project in schools, this study carves new ground by critically examining the outcomes of private-local collaboration and the ICT which was implemented.

Introduction

The development of local regions has historically been largely attributed to the degree of technological advancement and connections to global opportunities. Within the last few decades, public and private grantor entities have introduced technologies to disadvantaged schools as a means of uplifting local communities socioeconomically. Substantial funding has been devoted to Information and Communication Technology for Development (ICT4D/ICTD) globally. As Sreela Sarkar observed, "since the technology boom in the United States, the opening of Eastern European and Asian economies and the participation of private-sector firms in development activities facilitated the growth of ICTD projects around the world" (Gurumurthy & Singh, 2005; Patra, Pal & Nedevschi, 2009, in Sarkar, 2013). As a matter of fact, "in 2006 the World Bank had a portfolio of $3 billion in loans to ICT projects in over 80 counties, while USAID spent $200 million in 2004" (Kuriyan &Ray, 2009).

While these projects take place both internationally and nationally, currently the U.S. White House's $10-billion 2013-2018 ConnectED Initiative is partnering with 23 prominent technology organizations to bring Information and Communication Technology (ICT) resources to disadvantaged U.S. schools. Specifically, this study focuses on an underprivileged inner city Los Angeles school called George Washington Carver Elementary, which was granted approximately $1 million in technology from Apple Incorporated through the ConnectED Initiative.

The purpose of this research is to understand the implications of local school collaboration with Apple and of implemented technology for primary education. Inclusive in the scope of this research are certain possibilities and constraints due to limited empirical evidence regarding views of Apple representatives and, on a macro level, novel subject matter with abstract philosophical

implications. The intrinsic value and practical utility of technology is contemporarily under scrutiny and often differs on a case-by-case basis. Therefore, some abstract or implicated truths regarding organizational customs and expansive local imperatives are inconclusive in this study. Informed by the most relevant published academic discourse possible, this case study carves new ground by considering primary research harvested from face-to-face interviews in comparison with interests expressed by local actors in a school served by the ConnectED Initiative. Historical trends and modern utility of private organizations' expertise and education technology in the classroom are evaluated as a means for improved education structures and outcomes at the local level. Thus, practical deliverables such as local definition of implementation obstacles, increased access to teaching, learning, and assessment resources, increased student learning comprehension, and utility for classroom management through technology are more concretely defined due to directly observable benefits and complications presented by the technology and human resources in question.

Literature Review

Current case studies on the implementation of technology in schools have resulted in investigation of the effectiveness and sustainability of collaborative ICT4D projects. Comparatively fewer conclusions have been made regarding the cultural relevance, values employed or imposed, and relevant meaning(s) of technology to local subjects. Emphasizing each of these three crucial elements in initiative processes, this research project provides a deeper investigation the activities of ICT implementation serving the interests of local schools. This kind of work has been insufficiently explored in academic research.

The first line of inquiry explores the motivations behind calls to implement ICT in developing local areas and the ways to make such implementation effective. Gunn and

Hollingsworth (2013) summarize relevant research as demonstrating ICT's track record of creating learning opportunities and contributing positively to measures of academic success. Hosman and Cvetanoska (2010) argue that "true integration" of technology can foster critical thinking in students' learning framework. Gunn and Hollingsworth are similarly supportive, advocating for the role of ICT in cultivating "higher-order skills" like problem-solving and information analysis that are widely recognized as requirements for career success in a globalized world.

Rhema and Miliszewska highlight the important reality that technological inexperience on the part of both students and teachers can obstruct their ability to utilize ICT in classrooms to its fullest potential (2010). Munteanu et al. and Hosman and Cvetanoska also drew attention to this challenge, arguing that teachers must be given room to develop technological literacy before they are expected to incorporate it into their teaching strategies (Munteunu et al., 2012; Hosman and Cvetanoska, 2010). When project administrators do not extend training and freedom to experiment to the actual implementers themselves, teachers are less likely to utilize ICT in their classroom due to fears of inadequacy or even inferiority as their skills are juxtaposed with those of their students. Calls are being made for such commitments to close the gap between technological literacy and promoted pedagogy, especially in U.S. contexts (Gunn & Hollingsworth, 2013).

Within a variety of case studies located in culturally diverse local contexts, frameworks that arise for effective implementation are very similar. In Saudi primary schools, lack of staff training, technical support, maintenance, and infrastructure were considered primary barriers to implementation (Albugami & Ahmed, 2015). In Tanzanian higher education institutions, challenges were categorized as institutional (poor infrastructure, energy sources, technical support units, finances, and planning) and personal (lack of understanding of meaning and impact through e-learning in education, and resistance to change) (Kisanga & Ireson, 2015). Natia and Al-hassan

infer that Ghanaians face a lack of internet access, electricity, and power, inadequate numbers of computers, and inadequate technical know-how. A handful of researchers, including Phiri, foko, and Mahwai, who researched implementation in South African primary schools (2014), emphasize that implemented technology must be flexible, and more commonly, the adoption process must be collaborative between users. Through evaluation of an education program in Egypt, Pouezevara, Mekhael, and Darcy frame factors of sustainability as technological, individual and social, economic, and political (2014). Additionally, they ascertain that positive outcomes result from implementation teams and recipient schools being mutually active in the process.

Supporters of public-private partnerships contest that such initiative forms "increase efficiency and responsiveness in the delivery of hitherto government-provided services" (Lewis, 2000 in Kuriyan & Ray, 2009). In the case of telecenters in India, Lewis reports that public-private partnership in ICT implementation does influence the status of the public and private sector in society's eyes:

> Both entrepreneurs and the state use this blurring strategically and to their advantage for branding. The state is not 'rolled back' as such, but uses the blurring to reshape its image. The entrepreneurs use it to gain trust. Thus through their daily operations entrepreneurs create constructions of the state, which in turn give their own businesses legitimacy (Kuriyan & Ray, 2009).

Due to increasingly competitive and demanded services that provide customized technological access for education, private organizations are straining to create products which enable the best teaching, learning, and assessment opportunities by matching their hardware and software capacities to curriculum. As illustrated in Appendix A, these products are available only to the extent that the technology industry can create and supply such technologies and useful only

to the extent that they can be customized to meet teacher needs in the classroom (Burch & Good, 2015).

The second line of inquiry discusses the under-researched need for meaningful ICT implementation. Preceding the enthusiasm for ICT stands Klauss' warning that cultural narratives are inevitably embedded in ICT, designating any technological transfer as an essentially intercultural process, and caution that hasty application of technological "solutions" to situations may only be perceived as problematic by non-local agents (2000). Austin-Li et al. concur with this point, finding in their study that "rich media technologies [can be] regarded as 'support' rather than 'core' technologies" (2012), thus ICT should be treated as tools supporting other learning endeavors, rather than as the end goal. The reverberations of Klauss' concerns about the inherently relational nature of ICT transfers and the need for creative local transformation are heard today in Sun's understanding of value-laden technology. Sun cites the story of a well system that was constructed by a nongovernmental organization (NGO) in a rural village to reduce women's long trips to get water (2012). She describes the NGO's astonishment when the well was found vandalized multiple consecutive days. The women of the village actually enjoyed their long walks to get water because it provided a social break from their tedious work at home, illustrating that many attempted transfers of ICT can be unwelcome in developing locales. Sun also argues that "cross-cultural design is never neutral or instrumental." Thus, the design of ICT matters, and room must be made for flexible local transformation of technologies congruent with the community's culture(s) and identities if positive meaningful adoption is ever to be achieved.

Paulo Freire, writer of seminal theory on critical pedagogy in education, ascertained that Western education employs the "banking model" in which teachers integrate certain information through teaching and learning modes in classrooms, causing public education and its appendages

to participate in a colonial process (1970). Thus, U.S. culturally sensitive pedagogy can be expected to pervade U.S. government education technology initiatives to a certain extent. Sarkar, uncovering the origination of hybrid public-private initiatives in 19th century British colonialism and in current shifts to neoliberalist institutions, found that corporations have become crucial welfare providers. Sarkar connects that in 2000 the United Nations advocated for ICT as a "basic socio-economic need" and regarded access as involving participation from the state and private sector (2013). Along the same lines, the modern institution of public-private initiatives in India "renegotiate, reify and occasionally reproduce structural inequalities, especially for low-income and marginalized communities" (Sarkar, 2013).

Barbara Schulte, scholar of ICT implications on education, conveys that techno-determinism ("[presenting ICT] as the cure-all for various problems [in developing localities]") and techno-optimism ("[propagating] new technologies as effective instruments for erasing differences between learners and learning communities... particularly with regard to transplanting 'modern' education into rural communities") are strong perpetuators of ICT dissemination as a means for development. Kentaro Toyama, computer scientist and extensive literary and case researcher in the ICT4D field, emphasizes that "technology in and of itself does not have positive value," but fundamentally adopts and amplifies the motives of its user(s) (2015). As a fulfillment of this rule, technology "emerges and is manufactured in planned and inadvertent linkages between colonial and military expansion and circuits of capital" and "science and technology had the pedagogical function of rationalizing 'native' societies" (Sarkar, 2013).

Furthermore, often the value-laden technology in question is externally imposed by more developed urban populations upon less developed rural settings (Schulte, 2015). Schulte posed an alternative angle to postulations of dependence upon technology as an indispensable resource for

rural socioeconomic development. To understand how actors are constituted within the ICT4D dialogue, following her studies of ICT for Education in China, Schulte critiques the techno-optimistic agenda, which has solidified for centuries, and explains how in 19th and 20th century China, industrialization and its related technologies were brought to rural peripheries for development just as creativity and innovation is commodified within border-crossing techno-deterministic projects today. This retrospective observation contains the value of technology as essentially a tool which quickens and facilitates shifts in global trends. Toyama's research identifies that there are regions with advanced and proliferating technology, yet poverty rates and other measures of socioeconomic stability in the same areas have not improved (2015). Toyama challenges the increasing stand-alone value that the media, public, and individuals are placing on technology. His counterbalance to techno-determinism – the Law of Amplification – describes how technology "amplifies human efforts" in a "contest of cultures between creators and users." Schulte is also skeptical of the frameworks by which researchers and assessors approach the effectiveness of technology initiatives, and describes them as "quantitatively focused: e.g., considering school enrolment instead of context-specific use; uprooting: disregarding local knowledge and practices; politically and morally loaded: aiming for social stability and national cohesion at the expense of individual needs; economistic: reducing individual life trajectories to their economic usefulness."

The third line of inquiry examines the dynamics required for sustainable collaboration between global-local agents in the framework of educational transfers and other development projects. Burde (2004) strongly challenges paradigmatic views of NGOs as being effective implementers of educational "lending" projects. She attributes the failures of many NGOs to achieve their oft-stated goal of sustainable community change to the frequently-divergent

pressures placed on them by political interests, such as government bureaucracies, grantor agencies (*e.g.* USAID), and the NGO's own donor base. The restricted project timeframes and "deal making" that occurs as a result of these pressures has the effect of reducing the NGO's legitimacy in the eyes of the local population, ultimately inhibiting sustainable implementation of projects and long-term collaborations (2004).

As a result of varying methodology for ICT implementation, behavior of actors within the implementation process can be explained by the formulas for success to which they subscribe. Popular among researchers are arguments akin to a "strong and sustainable public-private partnership between the government, private sector, and civil society organizations" (Natia & Al-hassan, 2015). Framing this method as sustainable and strong could, however, jeopardize the recipient community because of its alleged dependence upon external support in the core-periphery model. The following additional factors are considered crucial to implementation success: proper training of teachers, the tone set by headmasters and facilitators, ICT policy clarity, recipient comprehension levels (Albugami & Ahmed, 2015), student and teacher elements in implementation, and the role of wider community relation to schools (Newhouse in Albugami & Ahmed, 2015). Some distinct approaches emerge slightly within parts of these project observations, such as Ali and Balur (in Pouezevara, Mekhael, & Darcy, 2014) who defend "de-emphasizing sustainability in favor of planning for and supporting capacity to innovate and respond to change in a constantly changing environment." Each of these measures of success and illustrations of barriers demonstrate that adamant stances exist within technology discourses, though they are not collectively homogeneous.

Perhaps in recognition of these potential failings inherent in the classic NGO model of educational development efforts, Prahalad puts forth the concept of for-profit involvement in

technological transfers, illustrating in numerous case studies the promise of for-profit enterprises to "co-create" solutions to poverty that benefit all stakeholders involved (Sivakumar, 2010, in Prahalad, 2010). The mutually-beneficial nature of these social entrepreneurships would apparently incentivize long-term collaborations. Using caution, the proposal for sustainable collaboration merits further consideration in light of the social utility and innovation the private sector can bring to the table. Additionally, it raises questions about the role of large for-profit enterprises such as Apple in this case study. The literature also raises questions about best practices for effective ICT implementation in developing education contexts, calls for meaningful implementation that allows for locally-relevant and acceptable transformation, and presents issues pertaining to the sustainability of collaborative partnerships between global-local actors.

Methodology

An empirical case study was conducted on an underprivileged school called George Washington Carver Elementary School in South Central Los Angeles, California. This case study includes observation of five classrooms ranging from 15 - 30 students, collection of 48 visual artifacts, and interviews of seven teachers, one technology specialist, one 21st Century specialist, one district technology visionary, and one school principal. Findings from data analysis are compared to published case analyses and rhetoric of private organizations, particularly Apple Incorporated. Qualitative interview and observational data is partially transcribed and comprehensively inspected for subjects' definitions of and frameworks for success, and aspects of the ICT and collaborative relationships provided which subjects identify as important links to success and conversely barriers to success. These manifestations are examined for deeper provisions for education processes and local development made possible through the ConnectED Initiative ICT grant. The narratives traced provide thick descriptions because they were mined

from face-to-face interviews (instead of large-scale surveys) as the primary method of data collection and analysis of key local actors situated within the implementation process.

The Case

National Context: The ConnectED Initiative

The 2013 – 2018 ConnectED White House Initiative serves 114 schools, which applied and were selected to receive approximately $1 million in education technology through partnership with Apple Incorporated and 22 other hardware and software organizations. President Obama announced in 2014 "Federal Communications Commission (FCC) funding for school and library connectivity with $2 billion specifically for Wi-Fi, and $1.5 billion more in annual funding, and more than $2 billion in private-sector commitments" (The White House, 2016). He defined the Initiative as a catalyst which "empowers teachers with the best technology and the training to make the most of it, and empowers students through individualized learning and rich, digital content." The participatory schools' demographics are comprised of ethnically diverse students and high percentages of students receiving free or reduced lunch rates.

Local Context: A Case Study on George Washington Carver Elementary School

In 2014, George Washington Carver Elementary School became one of five schools in the Compton School District whose application was accepted to receive the ConnectED grant. The principal knew that a one-to-one iPad-to-student ratio and application of blended, individualized, adaptive learning methods would help his students and that this "signature program" could differentiate his school. He expressed that students need to be motivated for continued education and to use their current education to learn problem-solving skills and practice creativity; therefore, he initially emailed Apple five to six times for an invitation to apply for the grant. Throughout Carver Elementary's three-year implementation partnership with Apple, 17 cumulative days of

professional development starting in February 2015 and "boot camp" in Summer 2015 for teachers, and four-day conferences for school project administrators in February 2015 and May 2016 were provided. Actual use of 400 iPads with $20 of pre-installed apps each for students and MacBooks, iPad minis, LCD projectors, speakers, and Apple TVs for teachers in the classroom began in January of 2016. Every local actor interviewed gave a report of overall positive impact.

The school is located on Success Avenue in South Central Los Angeles, bordered by tall, chain-linked fences, and supported by weathered, teal-painted industrial facilities, including two main classroom corridors and a multipurpose field for student recreation. Between classes children, in their well-worn uniforms comprised of green and yellow, sneakers, sweatshirts, and hair accessories of various bright colors, interacted with the principal, teachers, the security worker, and guest researchers (Bronwyn and I) with friendly gestures and remarks. Displayed in bright, bold painted letters above the main hallway a message read: "We are going to college!" The practically but meaningfully ornamented campus seemed to be an integral site for these students to assemble collectively as they grew individually.

The Compton Unified School District EdTech Strategic Plan explained that increased test scores, college attendance rates, student preparedness for careers, and decreased dropout rates are primary goals for this project. It explicitly identified "globalization's effects on the demands on the education system" due to the expanding amount of information available and an increasingly global market economy. Thus, Compton schools needed learning structures with project-based design in order for students to address "real world, complex problems" using strong digital research and interpersonal skills. Much of this shift at the district level was necessitated by newly adopted Common Core State Standards (CCSS) but also apparent calls for improved teaching and learning in language arts, mathematics, science, and social studies. The primary focus for the first

year of implementation was professional development for teachers. They were trained to use adaptive computer programs and assess students' activities in multiple modalities individually and in small groups. The EdTech strategic plan employed three pedagogical shifts: 1) The SAMR (Substitution, Augmentation, Modification, and Redefinition) Model shifted instruction to a process which utilizes applicable tools for participation in higher level activities and thus brings greater educational benefit. The last two stages allowed for flexible understanding across various tasks, "[extending] the walls of the classroom" (see Appendix C). 2) Student-Centered Learning promoted teacher adoption of both pedagogy and skills which enabled use of technology to no longer simply provide the same information to all students simultaneously. 3) The 4 C's (Communication, Collaboration, Critical thinking, and Creativity) instilled in the use of education technology prepared "21st Century students" for a "global society," by teaching them to "perform to high standards and acquire mastery of rigorous core-subject material". These shifts were enabled through customized applications which are periodically assessed and replaced by the district Educational Technology Department, ConnectED schools, and Apple Professional Development with more successful applications for classroom and student needs (see Appendix B).

Findings

Regarding this case study of collaborative private-local partnership (in which an NGO works with a local school to improve education in that particular school) under the administration of the ConnectED Initiative, findings were centered around four points of inquiry: 1) actor positioning in private-local collaboration, 2) local definitions of success, 3) private organizational practice, and 4) implications of technology in education specific to the technological provisions present.

How are actors positioned in private-local collaborative partnership?

Within this project, activities of Apple, the school district, school administration, and teachers were under observation. Each party expressed varying interest and brought different resources to the technology implementation process. For the most part, collaboration between these actors was driven by local interests. The level of success achieved by the school required a high amount of local activism and engagement, as well as local and private sector flexibility. The widely used "top-down" approach, in which challenges are categorized as infrastructural, economic, or due to lack of local cooperation and understanding, and success is quantitatively defined and easily uproots community knowledge and practices (Schulte, 2015) was inoperable in this case.

Apple as a private organization acted as a third-party expert, but sent individual technicians to set up technology infrastructure, and provided seminars to train teachers to use the technology. After the initial phase, one technician continued to maintain the technology, address issues teachers were facing, and in some cases provide one-on-one help to students during his weekly visits.

The school district set the theoretical framework, coined the "EdTech Strategic Plan" for appropriate utilization of technology by teachers and students. The district funded its district technology visionaries and 21st Century specialists (whose role was "helping teachers integrate" technology in the classroom) which service each school. Additionally, the district influenced school access to continued technology and support, because the school was required to fulfill needs such as its own full-time technician with its own savings. The technician hired by the school remarked, "maybe the district will renew the project if they see success," which demonstrated that the school is dependent on the district for sustenance of the project.

School administration, including the principal, heard the concerns of teachers and students and voiced actual school needs to the school district and to Apple. The principal himself carried

out his vision (informed by his prior and school-specific experiences) for his school: to be centered as a hub in his community and to provide increased higher education and career-focused preparation for his students.

Teachers were tasked with learning technology interfaces and carrying out the district's theoretical framework in their teaching (evidenced by posters lining classroom walls emphasizing district concepts of digital citizenship, the 4 Cs, and the SAMR model). However, they still taught according to their individual practices, priorities, and values, utilizing foundational knowledge and pedagogies to provide the best opportunities to their students.

How do local actors define success?

Implemented technology was perceived by district representatives, administration, and teachers as a resource, a catalyst for transformation, or a combination of both. The school district held the view that technology has the potential to "extend the walls of the classroom" as technology was to begin as a substitutionary resource and finally be integrated as redefining teaching and learning systems. School administration also aspired for higher level activities in its students, which were presented in the strategic plan as communication, collaboration, critical thinking, and creativity. These disseminated agendas were reported across campus by interviewees as transforming the teacher role to a "facilitator" and an "architect" of the individual student learning experience.

Four of the seven interviewed teachers represented granted technology as primarily a tool and resource. They often expressed that technology aids in individual preparation for standardized state tests and increases individual comfort with and "equal access" to technology in a changing world in which "technology isn't going away." One teacher remarked, "more than technology creates leaders" and that for technology to be effective, it must be "developmentally and socially

appropriate" because "people are complex." Teachers expressed how in "real life" students need abilities to solve issues, speak, be in a group, and collaborate. They must "know tools of the trade" and be "cognizant that the world has changed." Of this group of teachers, they affirmed that technology should not be considered as a silver bullet.

Three of the seven interviewed teachers conversely explained technology as predominantly an instrument for empowerment and transformation. A special education teacher said: "Give them an inch and they go a mile." She emphasized that she could not previously help her students reach individual student goals without technology, but its presence allowed students with excessive dependency disorders to become independent and some even moved to regular education classes. Another teacher said "students are more motivated." Because programs were designed to move at each student's level, boredom became avoidable. One teacher, who was proactive about effective teaching before the grant was even an option, said he "sets the bar really high" in his classroom by bringing more questions than answers to his students. He said that the dissemination of knowledge within a classroom and between classrooms "spreads like a wildfire." These factors were reported as leveling the playing field, and thus empowering students in a way which was otherwise insurmountable. The same teacher said his goal was for his students to learn "how to help themselves." A teacher who encourages his students to regularly present their coursework in front of the class said in regards to the access provided to his students, "who knows what's coming… they may be pioneers for something bigger."

What are the nature and outcomes of private organizational practice?

The technology and support from Apple, worth approximately $1 million, was appreciated and regarded as effective by all interview subjects. This manifestation aligned with Apple's aspiration to give "products, support, and opportunities to schools that need them most" (Apple

Inc., 2016). Apple positions itself as an organization with a high value for education, and advocates for digital citizenship and "21st century citizenship" in the digital age.

Throughout the implementation process, one teacher said that Apple technicians were "incredible" over the course of two months of interaction to date. They installed and maintained technology, troubleshot problems as they arose, as well as trained and advised teachers and answered their questions. Teachers mentioned that they would appreciate training closer to the time of implementation because training was conducted in the summer of 2015 and the technology was not received until January of 2016. Some teachers additionally expressed the need for a higher measure of training, one recommending it occur as often as once per week. This aligns with Julio Pertuze's (2010) findings that "frequent formal and informal interactions enhance the creation of knowledge," "strong personal relationships enhance the flow of knowledge," and "time facilitates the collaboration process" in collaborative industry-university partnerships in which innovation and perspectives of university agents inform the practices of companies (see Appendix F).

Individual and group learning was improved by Apple's technology designs and Apple technicians' consideration of complex, exact curricular needs. In some ways further tailoring of technology to student needs was warranted. For example, on iPad "roll-out" day, pre-allocated usernames and passwords were according to one teacher "humongous" and random, causing the initial setup to be confusing and prolonged for parents and students. Additionally, the principal mentioned that only Apple applications and products were originally installed, so he had to request certain other products which he researched to provide important value to education curriculum. Regardless, Apple provided new interfaces for students to become more digitally literate, while sustaining fundamental teaching and learning material, including standardized state test preparation, interactive reading programs, Common Core practice sets, and diagnostic, real-time,

data-driven programs for teacher's assessment of student performance (see Appendix D). These successes on the part of Apple represent that they mutually partnered for a common goal described by a teacher in a setting where many children are performing below their grade level in many subjects: students shouldn't be a "passive receptacle but actively learning."

Finally, the question of the sustainability of the project is both concerning and hopeful because of Apple's role. Many teachers explained that they initially feared the use of iPads would be underwhelming, because they are widely geared towards entertainment in everyday use. One teacher presented the question, "is Apple trying to access a new customer base in education?" Another remarked, "in education, technology always comes with strings" which have financial and social implications for the school itself and its community. Apple and its support will depart from this school three years after the time of implementation, which necessitates the school itself funding all aspects of the technology program at that time. The principal remarked that the school will continue "keeping up" with students and their needs, but that the school must itself create its own culture as opposed to the principal being the primary instigator.

What are the implications of education technology on teaching and learning?

Roles of the facilitative teacher and individual student learner were enabled, necessitated, and perpetuated through the existence of technology. Teachers were portrayed as facilitators and architects instead of imparters of knowledge akin to Paulo Freire's "banking model" of education. In these senses, the way in which technology was used was pivotal and highly influential as part of developing crucial individual capacities. This was due to the widespread presence of technology but also more importantly due to the new resources and opportunities offered therein.

First, technology enabled innovation. Children were encouraged and enabled to solve issues themselves, then teach one another by presenting their own work, individually and in

groups. Students could google search any topic or question, and teachers encouraged them to answer questions independently or collaboratively, then come to teachers for guidance.

Second, technology necessitated critical thinking. One teacher stated, in the context of exploratory learning with real life examples, that "students are sponges" who do more than expected with concepts they are taught. Students were encouraged to share their knowledge with confidence, and collaborate in a way which strengthens their social skills in preparation for their careers. All actors emphasized through their priorities that it is important to look beyond unitary measures of success. Technology and increased access in the global information economy demonstrated that individuals need a framework for tackling real life scenarios and difficulties.

Finally, technology perpetuated new challenges which warranted awareness of individual digital citizenship (see Appendix E). Teachers employed educational games as a teaching technique and a reward for diligent work. Regarding the use of entertainment-capable technology, a principal in a pilot study (see Appendix G) emphasized that she did not want her students to be "appetized." This dynamic of novel technology available to students caused some teachers to wonder if students will eventually lose interest in course content. Due to increased access to sources of information and increased ability to produce information, students were instructed on the basis of "digital citizenship," such that they were cognizant of their digital footprint. They were reminded that what is shared online is difficult, if not impossible, to retract. Students responded well to adequate adjustment time, discipline, and instruction and very few misdemeanors were reported by teachers. Due to technology use, discipline in the classroom changed in the sense that students are offered greater opportunity and can be rewarded using a scale of freedom attached to the level of responsible use.

In summary, through observation and interviews at George Washington Carver Elementary, some priorities expressed by the school district were quickly being met, such as student collaboration in student-led presentations and lectures, and elevation of students to their grade-level-appropriate skills. Emergent in interview subject responses was the understanding that in a developing economy with heightening demand for adaptability and intellect as a source of capital came the requirement for students to be comfortable with technology interfaces. Furthermore, technology was pivotally seen as a catalyst for empowering students substantially to be creative, critical thinkers and transforming the benefits received through their education. Some teachers were initially hesitant to introduce sophisticated technology in high volumes. iPads are geared for entertainment purposes, are costly to maintain and install, and exist in a rapidly changing and research and development intensive industry. Though the school saw continually increasing success at the time of the site visit, the aforementioned dynamics could make utilization ineffective, promote consumerism, or simply usurp important human functions in children's development. Through Intel's support of an Arizona school district, a representative of Intel said, "When your educational systems are better, you make the economy better and the world better. That's good for business… we all win when students are successful" (Schachter, 2013). Accordingly, as described by teachers, initial apprehensions generally were overshadowed by the greater need to obtain practical and pedagogical knowledge for successful integration of improved technology systems in teaching, learning, and assessment.

Summary

As a result of this project, four convergent narratives arose which pertain to questions of actor positioning, interests of local representatives, capacities of private organizations and

respective ICT products for accommodating local interests, and pedagogical implications of design-specific technology use in the classroom.

1. Successful local implementation required local initiative and solidarity of efforts around local imperatives, and was largely influenced by the control of actors participating through multiple points of entry, including private organizations, the school district, school administration, and teachers.
2. The value of education technology through this collaboration is dually implicated as a tool or resource and as a catalyst for transformation or empowerment.
3. In this case, collaboration with Apple as a private expert and partner motivated teachers, administration, and the school district to maximize the impact of technology for their students through a blended learning model.
4. Increased access by students to information through novel education technology interfaces enabled, necessitated, and perpetuated a pedagogical shift from teachers as imparters of knowledge to teachers as facilitators and architects, and from students as recipients of knowledge to students as individual inquisitors for competitive abilities.

Discussion

Kentaro Toyama said that we seem to have the "naive idea that technology is neutral." His Law of Amplification describes how the influence of technology is second to the influence of the human "heart, mind, and will" (2015). By this he means that technology yields to the imperatives of its designers and its users. In this case as well, it is not the technology which is transformative in and of itself; it is the unity of intent by multiple actors which allows this project to have lasting benefits for George Washington Carver Elementary's approximately 400 students and 18 teachers in its pre-k through 8th grades. At an increased rate, private organizations are eager to participate

in such collaboration and donative efforts under the banner of uplifting underserved communities through hardware and software products and expertise. At a practical level, students are utilizing programs which are motivating and designed to move at their individual levels: creating their own lessons and teaching those who are struggling.

In the words of a teacher who was "pleasantly surprised" by the effectiveness of the implemented technology, "In real life, you're on your own a lot. You need to be able to solve issues; speak to someone; be in a group; collaborate… Comfort [with] and access [to technology] is good… [but] it will create consumers: of the brand; the technology; skills for certain jobs. [Curriculum should be] developmentally appropriate and planned. Some should be planned by industry and some should be planned by teachers." Her grounded view aligns with Toyama's (2015) inference that "there's a big difference between learning the digital tools of modern life (easy to pick up and getting easier by the day, thanks to improving technology) and learning the critical thinking skills necessary for an information age (hard to learn and therefore demanding good adult guidance)."

This teacher elicited how sociologically, careers and curriculum both are driven by the information economy which commodifies creativity and causes peripheral regions to be influenced by changes at the core (Schulte, 2015). Stated by the principal, students were encouraged to orient themselves towards "STEAM" (science, technology, engineering, arts, and mathematics) careers because they are perceived as most prosperous in the modern market and information economy. Creativity has been commonly defined "within neoliberal discourse [as] the link between consumer culture and new forms of immaterial production" (Arvidsson & Niessen, 2015). In their study of consumption and creativity in Bangkok's fashion markets, Arvidsson and Niessen found that "creativity and markets are deeply integrated rather than opposed" (2015). Sreela Sarkar

highlights that "discourses of 'passion,' 'creativity'" and 'flexibility' are called forth by initiators of ICTD projects to craft the enterprising, self-disciplining neoliberal subject," (2013) demonstrating this new movement which should be further investigated regarding education technology in primary schools. This raises the question, does the presence of technology necessitate the pedagogical shift or does the pedagogical shift necessitate the use of technology? In the similar case of a rural North Carolina school which partnered with Samsung, teachers found that "the combination of pedagogy and technology made a big difference" (Schachter, 2013).

On the basis of ethnographic research, critical researchers have interrogated the understandings of "success" and "failure" arguing that success for powerful interests represents failure for others (Solomon, 2005 in Sarkar, 2013). Sarkar cites that "new technologies can reinforce social and spatial divisions and can help to consolidate the power of transnational corporations. ICT may not enable participatory communities but instead lead to a privileged group of 'networkers' who control financial and technological capital" (2013). Contrarily, the local perspective in this case study elicits the understanding that multinational corporations can, utilizing a public-private-local partnership form, adequately service under-resourced schools in a way that is meaningful to relevant users: students and teachers.

Conclusion

The outcomes of this study warrant continued advocacy by all actors for increased leverage and decision-making ability by local schools. Teachers and administration are best able to express which resources, allocation processes, technology, and needs are most relevant at the local level. However, interdependencies and hierarchies, as well as the historical structure of the relationships between each entity persist. George Washington Carver Elementary School is dependent upon the discretion of its school district, as well as the products available by private organizations. Yet the

school district provided standard pedagogy for teachers and the expertise of Apple technicians was a crucial, value-added resource which enabled technology to be incorporated effectively and used in locally meaningful ways.

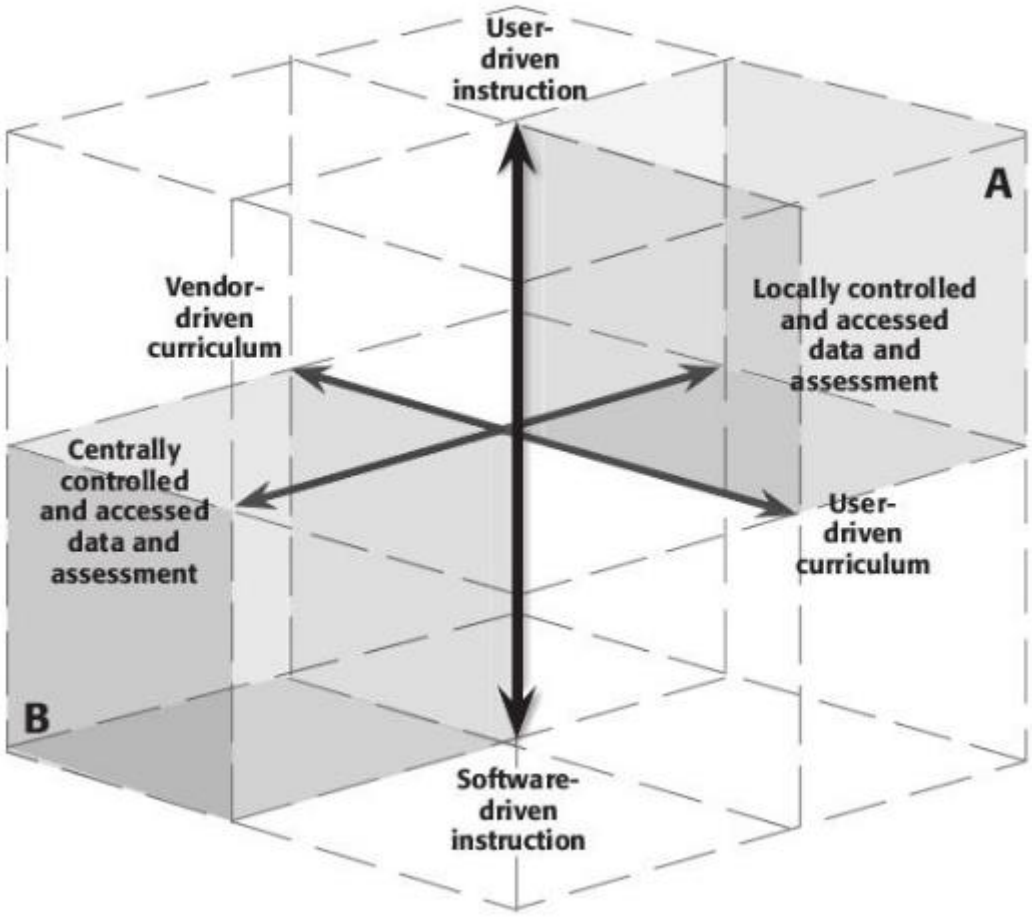
Additionally, these findings show that local-private collaboration is an available but under-utilized resource for underserved public elementary schools. Research has problematized the collaborative relationship based on local actors' resistance to change, subpar local infrastructure, or conversely a lack of private fulfillment of actual local imperatives. In this case, each dynamic issue was at play, but none overwhelmed the success of the project.

The significance of this research is to spark a more balanced inquiry of the intricacies within public-local grant collaborations. Much is remaining to be uncovered regarding the extent and impacts of ConnectED Initiative's influence in disadvantaged U.S. schools. Future studies should consider quantitative and qualitative measures of success pertaining to what is effective and sustainable, but also crucially what is meaningful as applied to the particular experiences of the communities being served. Data available in this study was harvested from agents in George Washington Carver Elementary School and was lacking Apple's own perspective of its vision, strategy, design, implementation, and support process. Thus, private practices must be further examined for their level of understanding of local imperatives. Studies should continue to investigate the sustainability of individualized technology as an educational tool, especially in regards to the rate at which models of technology become obsolete, the high cost of gaining access to education-specific technology, the continued debate of the value of technology, the implications of positioning teachers as facilitators, and the implications of ways in which students under the use of technology perceive information to be correct or true.

Furthermore, the notion of development largely drives the ConnectED Initiative and discourses of success in public, private, and education sectors. The term "development" and its users' definition(s) (such as colonialism, Westernization, cultural imperatives, acquisition of social capital, upward mobility, or capital accumulation, etc.) must be understood, due to their implications on schools and students. As additional studies are conducted, the following question should be answered: Is this shift in pedagogy and teacher-student positioning relatively superficial, or does it represent a deep shift and separation between classrooms with and without access to individualized education technology?

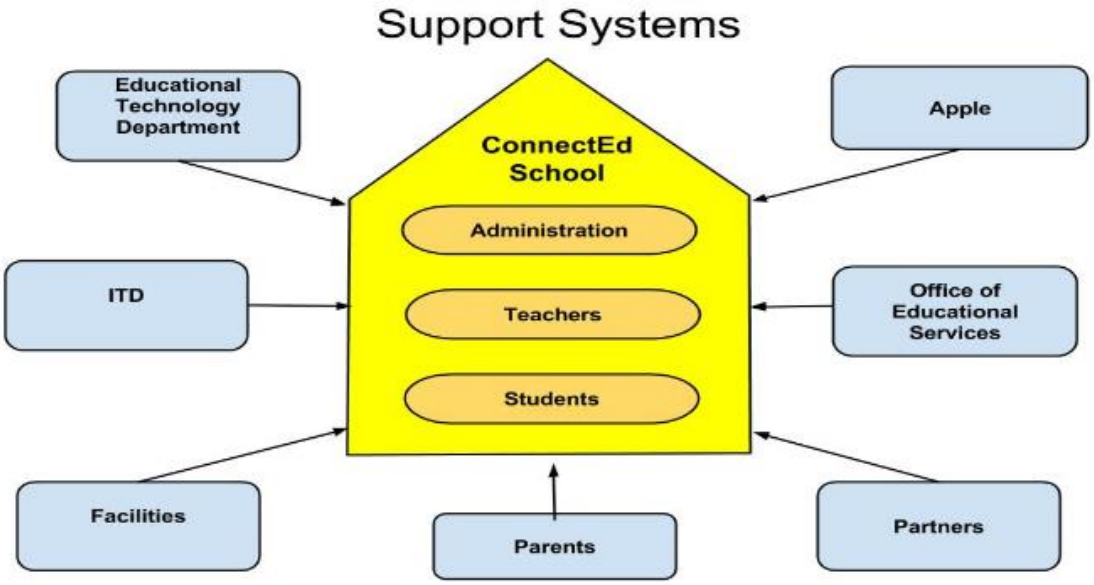
Appendix A:
Burch & Good's spatial illustration of curricular demands and the technology sector's provisions

FIG. 1.
The interplay of instruction, curriculum, data, and assessment in making decisions about digital education



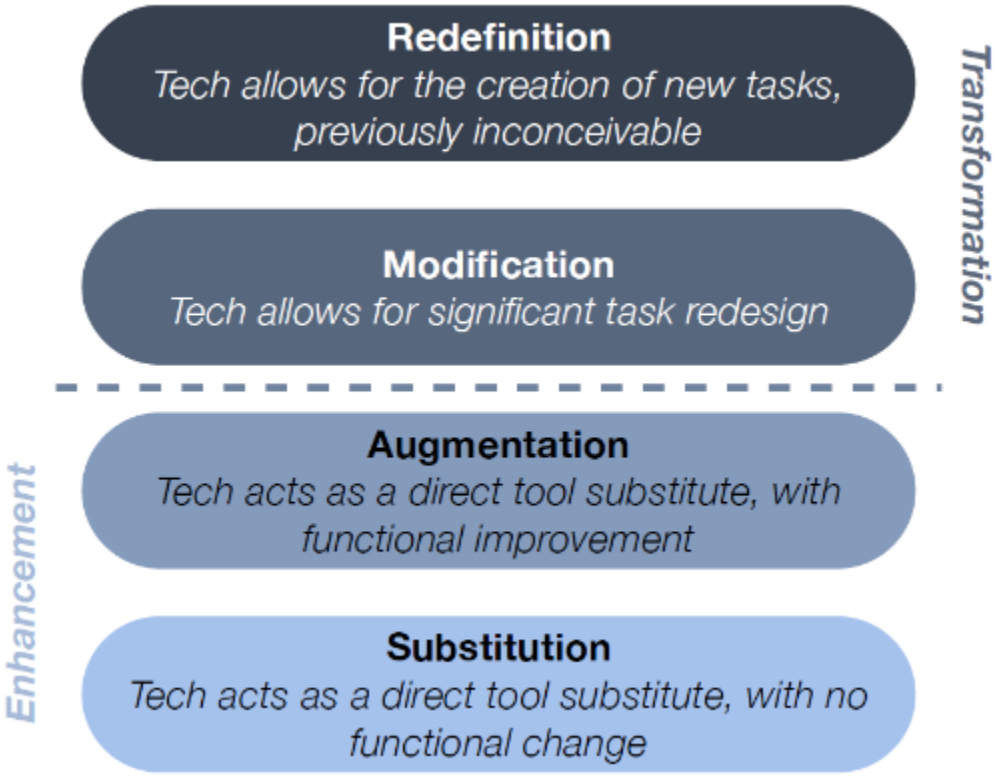
Source: Burch, P. & Good, A. (2014). *Equal scrutiny: Privatization and accountability in digital education.* Cambridge, MA: Harvard Education Press.

Appendix B:
Compton Unified School District 2015 - 2016 EdTech Strategic Plan's illustration of entities involved in the ConnectED Initiative technology project



CUSD EdTech Strategic Plan 3

Appendix C:
Compton Unified School District 2015 - 2016 EdTech Strategic Plan's illustration of the four steps in the SAMR Model



Appendix D:
Compton Unified School District 2015 - 2016 EdTech Strategic Plan's table of instructional strategies, pedagogical shifts, and "exemplar high-leverage" apps

Instructional Strategies	Pedagogical shifts	Exemplar High-Leverage Apps
Rigor and Relevance Framework	•SAMR •4 C's •Student - centered learning	iMovie Book Creator Explain Everything
Depth of Knowledge		Socrative, Nearpod, Google Apps
Complex texts		Pages, Google Apps, Padlet, Achieve3000
Cooperative learning		Keynote, Google Slides, Whiteboard, Popplet, Google Apps, Baiboard
Conceptual Understanding in Math		Numbers, Google Drawings, Explain Everything, Buzz Math

Appendix E:
"All Digital Citizens" poster displayed on classroom walls at George Washington Carver Elementary School

Appendix F:
Pertuze's Seven Best Practices which
"project managers can follow while collaborating with universities"

7 Best Practices

1. **Select projects that complement R&D taking place within the company.**
   - Align collaborations with company strategy.
   - Leverage existing or potential absorptive capacity.

2. **Select university researchers who understand specific industry goals and practices, or help them gain the knowledge.**
   - Search within your employees' network.
   - Recruit based on previous work or same industry consulting.

3. **Select Project Managers with strong boundary spanning abilities.**
   - Find individuals with diverse personal networks, communication abilities and deep understanding of the collaboration's field.

4. **Promote longer collaboration timeframes.**
   - Make expectations for time scales explicit.
   - Have flexible budgets to extend good projects.

5. **Provide appropriate internal support and accountability for project management.**
   - Allocate sufficient internal funding and time of the project manager.
   - Include project results as a part of the project manager's performance review.

6. **Conduct regular meetings at the company between university and industry researchers.**
   - Make this a requirement.
   - Encourage informal communications which build relationships and trust and increase the knowledge exchange.

7. **Build awareness of the university project inside the company**
   - Promote university researcher interactions with company personnel additional to the program manager.
   - Hold project managers accountable for reaching across company boundaries, even after the project is completed.

Appendix G:
A pilot study on an elementary school in Alabama

A pilot study involving an interview with an Alabama elementary school principal over video call provided a context for the local experience of collaborative ICT implementation with Apple technicians. The principal shared that Apple technology provided a greatly improved technological structure compared to the previous situation in which teachers shared outdated PCs and five projectors (funded by leftover Title 1 funds allocated by the district to the school), some of which were non-functional. Teachers were "so excited" to receive the ConnectED grant, and underwent professional development and strategic plan courses throughout Summer of 2015. The principal remarked that students initially exhibited irresponsibility (such as AirDropping a risqué image on the classroom projector), so iPads were "grounded" based on these misdemeanors. Since then, students have taken ownership of their learning opportunities available through the blended learning model and have learned the importance of digital citizenship. Children who fulfill requirements and act respectfully take their iPad home after school. The principal emphasized that her students are gaining early a fuller and stronger relationship with educational institutions and community organizations, such as upcoming geospatial summer courses offered by a local university. Overall, students are encouraged by the principal to be creators which maximize the information available to them and not consumers who are "appetized" by the use of iPads in their education.

References

Albugami, S., & Ahmed, V. (2015). Success factors for ICT implementation in Saudi secondary schools: From the perspective of ICT directors, head teachers and students. *International Journal of Education& Development Using Information & Communication Technology, 11*(1), 36-54.

Apple Inc. (2016). Education. *Apple.* Retrieved from http://www.apple.com/education/connectED.

Arvidsson, A., & Niessen, B. (2015). Creative mass: Consumption, creativity and innovation on Bangkok's fashion markets. *Consumption Markets & Culture, 18*(2), 111-132.

Austin-Li, S., Clothey, R., Weidman, J. C. (2012). *Post-secondary education and technology: A global perspective on opportunities and obstacles to development.* London, UK: Palgrave MacMillan.

Burch, P., & Good, A. (2015). More Important than the Contract Is the Relationship. *Phi Delta Kappan, 96*(5), 35-39.

Burde, D. (2004). International NGOs and Best Practices: The Art of Educational Lending. In G. Steiner-Khamsi (Ed). *The Global Politics of Educational Borrowing and Lending* (173-185).

Freire, P. (1970). *Pedagogy of the oppressed*. New York: Herder and Herder.

Gunn, T. M., & Hollingsworth, M. (2013). The Implementation and Assessment of a Shared 21st Century Learning Vision: A District-Based Approach. *Journal Of Research On Technology In Education (International Society For Technology In Education)*, 45(3), 201-228.

Hosman, L., & Cvetanoska, M. (2010). Creating a culture of use in ICT in education and development projects: The case of Macedonia. *Conference Papers -- American Political Science Association*, 1-19.

Kisanga, D., & Ireson, G. (2015). Barriers and strategies on adoption of e-learning in Tanzanian higher learning institutions: Lessons for adopters. *International Journal of Education & Development Using Information & Communication Technology, 11*(2), 126-137.

Klauss, R. (2000). Technology transfer in education–application to developing countries. *The Journal of Technology Transfer, 25*(3), 277-287.

Kuriyan, R., & Ray, I. (2009). Outsourcing the State? Public-Private Partnerships and Information Technologies in India. *World Development, 37*(10), 1663.

Natia, J.A., & Al-hassan, S. (2015). Promoting teaching and learning in Ghanaian Basic Schools through ICT. *International Journal of Education & Development Using Information & Communication Technology, 11*(2), 113-125.

Pertuze, Julio A. (2010). Best Practices for Industry-University Collaboration. *MIT Sloan Management Review, 51*(4), 83-90.

Phiri, A.C., foko, T., & Mahwai, N. (2014). Evaluation of a pilot project on information and communication technology for rural education development: A Cofimvaba case study on the educational use of tablets. *International Journal of Education & Development Using Information & Communication Technology, 10*(4), 60-79.

Pouezevara, S., Mekhael, S.W., & Darcy, N. (2014). Planning and Evaluating ICT in Education Programs Using the Four Dimensions of Sustainability: A Program Evaluation from Egypt. *International Journal of Education & Development Using Information & Communication Technology, 10*(2), 120-141.

Prahalad, C.K. (2010). *The Fortune at the Bottom of the Pyramid: Eradicating Poverty Through Profits.* Upper Saddle River, New Jersey: Pearson Education, Inc.

Rhema, A., & Miliszewska, I. (2010). Towards e-learning in higher education in Libya. *Issues in Informing Science and Information Technology, 7*(1), 423-437.

Sarkar, S., Chakravartty, P., Basu, A., Fountain, J., & Fuentes-Bautista, M. (2013). *Technology and Modernity at the Boundaries of Global Delhi*, ProQuest Dissertations and Theses.

Schachter, Ron. (2013). High-Tech Partnerships Mean Business. *District Administration, 49*(1), 48-52.

Schulte, B. (2015). (Dis)Empowering technologies: ICT for education (ICT4E) in China, past and present. *Chinese Journal of Communication, 8*(1), 59-77.

Sider, S. (2014). School leadership across borders: Examining a Canadian-Haitian partnership to support educational capacity-building in Haiti. *International Studies in Educational Administration, 42*(1), 1-13.

Sun, H. (2012). *Cross-Cultural Technology Design: Creating Culture-Sensitive Technology for Local Users.* New York, NY: Oxford University Press.

Toyama, K. (2015). *Geek Heresy: Rescuing Social Change from the Cult of Technology.* New York, NY: PublicAffairs.

The White House (2016). ConnectED. *The White House.* Retrieved from https://www.whitehouse.gov/issues/education/k-12/connected.