

**Engaging School Districts in Research-Based Inquiry to
Advance 21st Century Learning in Ontario**

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**Paper presented to International Congress for School Effectiveness and
Improvement, January 2017**

in a multi-paper symposium

Collaborative Partnerships for System-Wide Educational Improvement

Contents

Abstract.....	2
Introduction	3
Ontario’s Landscape: Geographic, Demographic and Economic	3
Ontario’s Education System	4
Ontario’s Foundation for Success	5
Why 21 st Century Learning?	6
The Role of Technology	9
Ontario’s System Approach to 21 st Century Learning	10
Design Feature of Ontario’s Approach: Pedagogy before Technology	11
Design Feature of Ontario’s Approach: Collaborative Partnerships	11
Design Feature of Ontario’s Approach: Evidence-Based	12
Key Findings From Ontario’s TLF 21st Century Innovation Research Projects	14
Conceptual Framework and Methodology	14
Findings – Impact on Students.....	16
Findings – Impact on Teachers	18
Findings – Impact on System.....	19
Conclusion.....	22
References	23

Abstract

This paper examines Ontario's approach from 2011-2016 to engage the province's 72 school districts in inquiry-based research to investigate the impact of over 100 local innovation projects, enabled and enhanced by technology, on students, teachers, and systems. It situates Ontario's methodology, collaborative approach and results of its five-year research investigation within the wider provincial context of Ontario's successful educational improvement agenda. Ontario's 21st Century Innovation Research Projects, co-sponsored by the Ministry of Education and the Council of Ontario Directors of Education (CODE), contributes to international discourse by sharing insights about the impact of 21st century learning and teaching practices, enhanced by technology, and the transformation of education for deeper learning and global competencies.

An external research team built upon conceptual framework models (OECD, 2009) to guide systematic study into technology effectiveness in education, using collective case study methodology (Stake, 2005) to understand the unique features of individual projects, as well as the larger collection. The research study demonstrates how local school innovations can be partnered with a systemic approach and central support to contribute to improved learning outcomes at scale. Impacts are evident in improved student learning; teacher practice; and system transformation. In an increasingly technology-intensive, globalized world, Ontario's findings may prove useful to other jurisdictions seeking to engage school districts, educators, and their students in pedagogy-driven learning and teaching approaches enhanced by technology.

Introduction

Ontario, like many jurisdictions around the world, is taking steps to ensure the ongoing relevance and effectiveness of its education system to prepare students to become “personally successful, economically productive and actively engaged citizens” in the economies and societies of the 21st century (Ontario Ministry of Education, 2014). Though beyond the scope of this paper to address in any depth, in brief, calls for education systems to keep pace with the changing times are often linked to: new technology-driven, globalized knowledge economies and societies which demand new student competencies; emerging evidence on pedagogy-driven learning and teaching approaches enhanced by technology; and changing expectations of “millennial learners” for whom digital and social media, mobile technologies and access to online and self-directed learning feature prominently in their everyday lives outside school (Tapscott, 1999; Prensky, 2001; Rychen & Salganik, 2001; Levy & Murnane, 2004; Ananiadou & Claro, 2009; Dumont, Istance, and Benavides, 2010; Dede, 2010; Griffin, McGaw, & Care, 2012; Pellegrino & Hilton, 2012; Fullan & Langworthy, 2014).

These forces and changing expectations among learners, employers, and citizens are affecting “what is taught, how it is taught, and how students are assessed” (Bransford, Brown, & Cocking, 2000, p. 153) and have become the catalyst for a public policy focus on advancing 21st century learning in Ontario. Accordingly, prior to delving into a discussion of Ontario’s collaborative approach and results of its five-year research investigation to advance 21st century learning across the province, this paper will provide a contextual overview of Ontario, its public education system, and its foundation of collaborative partnerships for system-wide educational improvement.

Ontario’s Landscape: Geographic, Demographic and Economic

Ontario is Canada’s second largest province, covering over 415,000 square miles, an area greater than the size of France and Spain combined (Ontario Government, 2016a). It is characterized by its large urban centres in Southern Ontario near the Great Lakes, surrounded by rural towns and increasingly less populated communities as one travels north as far as Hudson Bay.

Of all Canada’s thirteen provinces and territories, Ontario is the most populous. With nearly 14 million residents or about 40% of Canada’s 36.3 million population (Statistics Canada, 2016), one of Ontario’s most striking characteristics is its demographic diversity. 1.85 million Ontarians have a disability (People Access, n.d.); Aboriginal peoples make up about three percent of the population (Ontario Government, 2016a); the Francophone population represents the largest Francophone community in Canada outside of Quebec (Ontario Government, 2016b); LGBT communities account for five percent of the provinces’ population (Carlson, 2012); and each year Ontario welcomes over 100,000 newcomers – nearly half of all Canada’s immigrants - making the province home to people from more than 200 different ethnic origins and languages and a variety of religious groups (Ontario Ministry of Citizenship and Immigration, 2013).

Generating 37% of the national GDP, Ontario’s economy thrives through a combination of resources, manufacturing expertise, exports and a drive for innovation (Ontario Government, 2016a). Its workforce is diverse and recognized as well credentialed (Premier’s Highly Skilled Workforce Expert Panel, 2016). However, Ontario, like many jurisdictions, is currently facing

economic upheaval due to rapid advances in technology, increasingly porous borders, and shifting work practices (Florida, Shuttters & Spencer, 2016). In fact, a recently released Martin Prosperity Institute report asserts that in order to succeed in the 21st century economy, Ontario “must develop vibrant “knowledge economies” underpinned by creativity, innovation, and entrepreneurship” (Florida et al., 2016). These are among the competencies that the Ministry of Education has also been considering developing in students (Ontario Ministry of Education, 2016b) in order to address new economic, as well as social and civic demands.

Ontario’s Education System

Public elementary and secondary education is under provincial jurisdiction in Canada; there is no national education ministry. Ontario’s education system is organized on three levels, within which the Ministry of Education, school districts, and schools, form the nucleus of the system. Education is second only to health in its share of the Ontario budget, with 2016-17 funding for public education at approximately CDN \$23 billion (Ontario Ministry of Education, 2016a).

There are nearly 5,000 schools in Ontario and they are administered through 72 school districts. The Ministry of Education also administers provincial and demonstration schools for pupils who are deaf, blind, deafblind or have severe learning disabilities. The province provides educational services through both public and Catholic schools and school districts and students in Ontario also have an entitlement to education in either of Canada’s two official languages, English and French. Accordingly, Ontario provides educational services in both English-language and French-language, and in public and Catholic schools and school districts.

Ontario has 2.1 million students, of which 27% are born outside Canada (Ontario Ministry of Education, 2014). Ontario enjoys one of the most diverse multicultural populations in the world, particularly in the province’s urban areas, and the school system plays a critical role within the province’s network of services for newcomers, with a large annual influx of English- and French- language learners. The fact that educational services are provided over a substantial geographical area means that schools and school districts in urban, rural, and remote communities have distinct needs and face unique challenges.

Ontario school districts employ over 115,000 full-time equivalent teachers (elementary/secondary), all of whom are required by law to be members of the Ontario Teachers’ Federation, the provincial teachers’ professional association (Ontario Ministry of Education, 2015). The teaching profession is self-regulated by the Ontario College of Teachers, which has a mandate to license and regulate the Ontario teaching profession in the public interest. As a result of recent reforms that enabled all four- and five year olds to attend full day kindergarten programs in publicly-funded schools, Ontario also employs over 7000 early childhood educators.

Through a K-12 curriculum that identifies the knowledge and skills students are expected to develop in each subject and grade level, the Ministry sets standards for the entire province which are informed by currently available research and benchmarked against national and international education standards.

Ontario's Foundation for Success

Today, Ontario's publicly-funded education system is recognized as among the best in the world (Mourshed, Chijioke & Barber, 2010). The province has seen a steady improvement in the number of secondary school graduates. In fact, in 2015, Ontario's high school graduation rate reached 85.5% per cent – the highest level in the province's history.¹

With the strength of the education community, Ontario has been able to introduce multi-faceted reforms to publicly-funded education, making it the system of choice for 95% of Ontario's students and their families (Office of the Premier, 2016a). Significant progress has been made in a number of areas including: child care and full-day Kindergarten; high quality learning and teaching from Kindergarten to Grade 12; a robust leadership strategy; healthy, safe, accepting, and inclusive school policies; an equity and inclusive education strategy; hands-on and engaging secondary school programming; an internationally respected curriculum benchmarked to international jurisdictions and based on extensive research and consultations; an e-Learning strategy; a First Nation, Métis and Inuit education policy framework; improved school board governance; the *Politique d'aménagement linguistique*; parent engagement; and a prominent role for the student voice.

Ontario's continuous improvement in student achievement has drawn interest from international delegates and the broader research community curious to learn about Ontario's theory of action and the active ingredients behind this sustained success at whole system reform. The OECD (2012a) has noted that contributing factors to success in Ontario's approach include clear recognition that reform is a two-way street, rather than simply something imposed from the top, as well as a focus at the school level where change has to happen, premised on a sense of shared understanding and common purpose at every level of the system, and founded on respectful relations and government confidence in the quality of its teaching force. Ontario's approach has also paid special attention to leadership development, especially for school principals and vice-principals. It has intentionally given prominence to the importance of student voice and choice in a number of ways, including through the establishment of formal structures such as the Minister's Student Advisory Council (MSAC) as well as vehicles for supporting students' active role as researchers (Students as Researchers projects) and change agents.

Other factors attributed by the OECD to the sustained success in Ontario's education reforms include the framing of advanced literacy and numeracy skills as a means to enable students to solve real-world problems, and an approach to critical and creative thinking where "the development of these skills and habits of mind are not the subject of a single course or strand of the curriculum, but rather are woven into virtually all aspects of schooling" (OECD, 2012a, p. 144). The OECD notes that "(t)his focus can be found across the curriculum as well as in the increasing attention Ontario schools have paid to the use of formative assessments at the school level. But most critically, this focus has driven deep, sustained investments in building the capacity of Ontario's teaching force to work collaboratively to examine their own practices and the effect of those practices on the quality of student work. As Ontario's curriculum, assessment,

¹ This figure represents the number of students obtaining an Ontario Secondary School Diploma (OSSD) within five years of starting high school. The percentage of students graduating within four years was 78.3 per cent, an increase of more than 22 percentage points since 2004, when it was only 56 per cent.

and reporting system has moved from an emphasis on mastery of facts to an understanding of ‘big ideas’ and the ability to apply one’s knowledge to the problems one confronts in everyday life, the teacher-learning agenda has kept pace accordingly” (OECD, 2012a, p. 144).

Yet while Ontario has made significant progress in closing achievement gaps, the province continues to face complex challenges. Aboriginal learners, youth in care, learners with mental health issues, and those in need of special education support still struggle within the system. The Ministry of Education continues to work with its education partners to provide targeted supports and programs to support all learners.

Overall, Ontario’s reforms and resulting gains in student achievement have provided a foundation for the province to build upon its reputation as a world leader in education by helping more students to succeed than ever before, while maintaining high expectations and standards for all learners and promoting safe, accepting, and inclusive schools. Ontario’s accomplishments in education have been guided by an unwavering focus on three core priorities: increasing student achievement; closing gaps in achievement; and increasing public confidence in publicly-funded education. The next phase of Ontario’s education strategy, outlined in *Achieving Excellence: A Renewed Vision for Education in Ontario (2014)* continues to ensure that Ontario’s students benefit from relevant, enriching, and effective learning experiences that prepare them for today and the future.

Why 21st Century Learning?

We live in a rapidly changing world that is increasingly being described as “VUCA”: volatile, uncertain, complex, ambiguous (Fadel, Bialik, Trilling, 2015). Technological acceleration points to unimagined possibilities and challenges. As the OECD’s Andreas Schleicher (n.d.) portrays vividly, schools need to embrace 21st century learning in order to equip young people for success in a fast-changing world and for “jobs that have not yet been created, technologies that have not yet been invented, and problems that we don’t yet know will arise.” Chris Dede (2014) of the Harvard Graduate School of Education offers related insight, stating that the rising emphasis on 21st century skills, global competencies, and deeper learning is “a recognition that the nature of problems in the world is changing, and that society requires problem-solvers who are prepared in new ways to attain different skills” (p. 6 as cited in Dede & Frumin, 2016).

In Ontario’s foundation document for discussion entitled *Towards Defining 21st Century Competencies for Ontario*, the authors note that, “Researchers acknowledge that the need to engage in problem solving and critical and creative thinking has ‘always been at the core of learning and innovation’ (Trilling & Fadel, 2009, p. 50 as cited in Ontario Ministry of Education, 2016b). What’s new in the 21st century is the call for education systems to emphasize and develop these competencies in explicit and intentional ways through deliberate changes in curriculum design and pedagogical practice. The goal of these changes is to prepare students to solve messy, complex problems – including problems we don’t yet know about – associated with living in a competitive, globally connected, and technologically intensive world” (Ontario Ministry of Education, 2016b, p.3).

Many international thought leaders, business leaders, and young people themselves argue the case to address ‘21st Century skills,’ ‘higher order skills,’ ‘global competencies,’ ‘next generation learning,’ ‘deeper learning,’ and ‘connected learning’ through public policy (Ontario Ministry of Education, 2016b). “How do we educate our children to take their place in the economies of the 21st century given that we can’t anticipate what the economy will look like at the end of next week?” asked Sir Ken Robinson (2010). Indeed, calls for educational change acknowledge the economic imperative; the requirements for a highly skilled, adaptive labour force in an increasingly competitive economy where creativity, innovation and entrepreneurship are viewed as capacities that set apart successful individuals, businesses, societies, and economies from others (Dede, 2010; U.S. Department of Education, 2010; OECD, 2012b; Hagel et al, 2010; Conference Board of Canada, n.d.; Robinson, 2010; UNESCO, 2012; Premier’s Highly Skilled Workforce Expert Panel, 2016). As one Ontario business leader and economist stated succinctly: “If the next 15 years are anything like the last, during which we restructured how we work (Internet, mobile), communicate (smartphones), interact (Facebook, Twitter), shop (Amazon, eBay), listen to music (iTunes, iPods), plan trips (TripAdvisor, Expedia) and find information (Google, Yahoo), then literacy, numeracy, creativity, adaptability and entrepreneurship will be the name of the talent game” (Lynch, 2014).

Yet, recognizing the need for educational change in the 21st century goes beyond economic demands. In fact, the Ministry of Education is undertaking the development of a student well-being strategy, stating: “If our goal in Ontario is for all of our students to become active members of their communities, able to bring about positive change and to flourish in society, we must heighten our focus on well-being as a crucial prerequisite for long-term success” (Ontario Ministry of Education, 2016d). Relatedly, “self-direction,” “global citizenship,” and “sustainability” are among the key global competencies which the Premier has directed curriculum and assessment practices be updated to reflect (Office of the Premier, 2016b).

Indeed, a critical component of 21st century learning involves the development of global competencies – often referred to as “21st century skills” or “deeper learning” (US National Research Council, 2012a), whereby “deeper learning” manifests as a person’s ability to successfully apply what they learned in a particular context, to different contexts (US National Research Council, 2012b). This is commonly known among educators as “learning for transfer”. To promote transfer, researchers have suggested redesigning social learning contexts to foster cognitive apprenticeship (Collins et al., 1989), communities of practice (Lave, 1991), communities of learners (Brown & Campione, 1994), knowledge building communities for deeper understanding (Scardamalia & Bereiter, 1994), and deep learning (Fullan & Langworthy, 2013).

This capacity of knowledge transfer to solve new problems, by individuals, organizations, companies and nations, is arguably ever-more important in the context of a dynamic, unpredictable and increasingly connected global knowledge economies and societies. Fullan and Langworthy (2013) similarly make the case for deep learning goals enabled by new pedagogies and accelerated by technology, and present new research evidence that shows that when individuals are exposed to real-world problem solving experiences as part of their schooling, it contributes to higher quality work at later stages. Dede and Frumin (2016) state that “the emphasis in school must shift from teaching what is already known (“learning about”) towards

teaching how to address “hard” problems, such as global climate change or the appropriate role of government in shaping individual life – topics that are currently not completely understood and that require interpretation among points of view” (p.6).

The US National Research Committee, like others (including Saavedra & Opfer, 2012), offer rationale for why jurisdictions and nations increasingly view global competencies to be of high importance for all students and citizens in an emerging technology-driven, knowledge economy and civic society: “The pervasive spread of digital technologies has increased the pace at which individuals communicate and exchange information, requiring competence in processing multiple forms of information to accomplish tasks that may be distributed across contexts that include home, school, the workplace, and social networks” (Pelligrino, J.W. & Margaret L. Hilton, 2012). The Premier’s Highly Skilled Workforce Expert Panel (2016) validates such reasoning with their vision that people should “display cultural competencies, have a high degree of civic literacy” (p.10) and specific recommendation to identify promising practices for teaching competencies such as “problem solving, team work, and entrepreneurial spirit across curricular and extra-curricular learning opportunities, including through the arts, sports, math and science” (p.64).

At the same time, there is heightened recognition, in the context of economic constraints, for evidence-based decisions. Much is known about evidence-based high-yield instructional practices as made prominent in recent years by John Hattie’s (2009) landmark comprehensive education report, *Visible Learning: A Synthesis of Over 800 Meta-Analyses Relating to Achievement*, yet, more research is required to support changes in teaching methods to integrate proven high-yield practices, so they become ubiquitous pedagogical practices in all classrooms. Jurisdictions such as Singapore, North Carolina, Alberta, the United States, and member jurisdictions in the European Union, among others, are making efforts to leverage evidence-based 21st century education policy models to influence classroom pedagogical practice. For examples, see the *North Carolina Digital Learning Plan* (North Carolina State Board of Education, 2015); U.S. Office of Education Technology *Learning Effectiveness Report* (U.S. Department of Education, 2014); Alberta’s *Learning and Technology Framework* (Alberta Government, 2013) and Singapore’s *21st Century Competencies* (Singapore Ministry of Education, 2015).

In times of fiscal restraint, there is also an even greater need for cost-effective and efficient education delivery options that support more flexibility and personalization in learning opportunities for learners, including anytime, anywhere, any device, cross-platform virtual learning opportunities. Traditional, virtual, or blended learning environments are also associated with effective learning outcomes through increased student motivation to invest the time, effort, and perseverance required for success in learning (OECD, 2010; Wideman, 2013; Saavedra & Opfer, 2012).

21st century learning is a field with a research foundation that draws heavily from earlier research on information and communications technology (ICT) in education, instructional design, and more recently, blends research evidence from the cognitive sciences on how people learn with research evidence on effective whole system change, change leadership, and effective 21st century learning environments. It takes in technology-enabled instructional design; and yet, as

Ontario researchers Jenson, Taylor and Fisher (2010, p. 4) note, 21st century skills “...are not always or necessarily ICT-dependent (Annetta et al., 2010; OECD, 2009)”. In fact, technology-enabled innovations in education have the power to reshape and open up learning environments to the digital, physical, and social environment; often bringing new actors and stakeholders (OECD, 2016). The next section will further this analysis and delve into what, exactly, is the role of technology in 21st century learning and teaching.

The Role of Technology

Technology and technology-driven innovation have become ubiquitous in our society. A recent OECD (2016) report, *Innovating Education and Education for Innovation* establishes the significant role of technology in transforming education: “The steep increase in the use of digital devices and the Internet with increasing levels of education shows that education matters in the uptake of digital technologies. This has huge implications for the role of education systems in equipping individuals with the skills they need to benefit from new technology [...] Digital skills generate a significant return in terms of employment, income and other social outcomes for those who have them, but set up barriers to better life opportunities for those without” (p.9). Though it is beyond the scope of this paper to address disparity in any depth, it is important to note that this discourse cannot be detached from the challenge of advancing digital equity.

In an extensive review of the literature on technology and teaching in the 2016 American Educational Research Association Handbook of Research on Teaching (5th Edition), Fishman and Dede (as cited in Dede & Frumin, 2016) consider how and under what conditions technology can be productively employed by teachers to more effectively meet the challenges presented by a rapidly evolving world. They argue that technology as a catalyst is effective only when used to enable learning with richer content, more powerful pedagogy, more valid assessments and links between in-and out-of-classroom learning. Dede and Frumin (2016) contend that instructional strategies that promote deeper learning can be augmented with new tools and media, “mirroring the way real-world work settings have changed across many sectors of the economy” (p.9). According to Dede (2014), “teachers will find it hard to provide deeper learning opportunities without employing technology given that characteristics of students are changing as their usage of media outside of academic settings shape their learning strengths and preferences” (Dieterle, 2009 as cited in Dede & Frumin, 2016, p.9).

Despite the pervasiveness of digital technologies in everyday life, OECD (2016) international survey data indicates that the education sector has not yet been able to leverage technology to improve teaching, learning, productivity, efficiency, quality or equity; although there have been qualitative improvements to education and considerable investments in educational resources as well as information and communications technology (ICT) in schools. At the same time, the OECD (2016) also acknowledges, “Although they cannot transform education by themselves, digital technologies do have huge potential to transform learning and teaching practices in schools and open up new horizons. The challenge of achieving this transformation is more about integrating new types of instruction than overcoming technological barriers” (p.10).

Indeed, digital technology has the potential to reform classrooms in ways that were seldom considered possible before the beginning of the 21st century. The fundamental role of teachers in

technology-enabled classrooms is transformed from that of gatekeepers of knowledge to resource managers and design consultants (Knobel & Wilbur, 2009 as cited Curriculum Services Canada, 2016). Digital technology can facilitate simulations such as remote or virtual online laboratories; international collaborations; real-time formative assessment and skills-based assessments; e-learning and innovative pedagogic models (OECD, 2016). Through its TLF 21st Century Innovation Research Projects, Ontario is at the forefront in addressing these possibilities in public education on a provincial scale. The following section will discuss Ontario's approach from 2011 through 2016 to engage *all* 72 school districts, school authorities, and provincial schools, in voluntary, collaborative, inquiry-based research to investigate the impact of learning and teaching, enhanced by technology, on instruction and student engagement, and ultimately on learning and achievement.

Ontario's System Approach to 21st Century Learning

In 2014, Ontario released a renewed vision for the province's education system, designed to ensure students acquire the knowledge and skills they need to thrive. The renewed strategy, *Achieving Excellence*, continues to focus on basics like reading, writing and math, while placing a new emphasis on 21st century learning, including: innovative learning and teaching practices, enhanced by technology, and competencies like creativity, collaboration and global citizenship, which will be referred to as global competencies from this point forward.

To advance the goals of its renewed vision around 21st century learning, the province introduced a \$150 million investment – Technology and Learning Fund (TLF) – over three years, to support district school boards in their efforts to develop new learning and teaching practices, enhanced by technology. Though the province had been providing boards with funding prior to 2014, the official TLF investment signaled a paradigm shift of moving beyond the acquisition of digital technology to investment in related professional learning for educators and an emphasis on supporting system transformation oriented to deeper learning practices. The scope of the TLF is system-wide, evidenced by the engagement of all 72 of Ontario's school districts, school authorities and provincial schools, in inquiry-based research to understand the impact of their TLF 21st Century Innovation Research Projects on students, teachers, and systems.

Through their voluntary participation in innovation research projects, co-sponsored by the Council of Ontario Directors of Education and the Ministry of Education, school boards are actively contributing to the local, provincial, and international knowledge base around effective technology-enabled 21st century learning and teaching. In 2015-16, over 265,000 students and 15,000 teachers across the province championed 21st century learning practice in a very real and applied way in their classrooms, schools and local jurisdictions. Concurrently, the Ministry engaged in the review and analysis of academic research, inter-jurisdictional scans, international think pieces and insights from TLF 21st Century Innovation Research Projects. Key findings, including a set of six draft global competencies², were summarized in *21st Century Competencies Foundation Document for Discussion* (Ontario Ministry of Education, 2016b) and shared with all school boards in

² 1. Critical Thinking and Problem Solving, 2. Innovation, Creativity, and Entrepreneurship, 3. Learning to Learn / Self-Aware & Self-Directed Learning, 4. Collaboration, 5. Communication and 6. Global Citizenship.

2016. Taken together, Ontario's theory of action recognizes a need to both balance and blend knowledge from professional practice and from research, emphasizing the importance of evidence- and research-informed decision making.

Design Feature of Ontario's Approach: Pedagogy before Technology

When the Ministry of Education partnered with school districts to learn from learning and teaching innovation projects, enhanced by technology, teacher-leaders and school- and system-leaders were all among the prime advocates for pedagogy-driven innovation. Ontario's approach to focused innovation is aimed at the instructional core, and echoes this OECD (2016) contention: "Simply introducing digital technology into education for technology's sake does not materially improve results. Such whole-system reforms need to place teaching practice rather than technology in the driving seat" (p. 9).

Beginning in 2015, all initial teacher education programs in Ontario were required to include the provision of opportunities for teacher candidates to practice their learning on pedagogy-driven, technology-enabled learning and teaching practices, set within foundational knowledge from the science of learning. Ontario also provides Additional Qualifications courses to in-service teachers such as the *Integration of Information and Computer Technology in Instruction and Assistive Technology*. In the words of one Director of Education, "We've learned so much about how effective learning and teaching happens in the province of Ontario, and we need to hold onto that learning and figure out how technology makes it richer... We're on a strong learning and teaching journey and now we're incorporating technology into it" (Curriculum Services Canada, 2014). Indeed, the multi-phased, multi-year approach to defining 21st century learning in Ontario is driven by strong pedagogy that is evidence- and research-informed, enabled by technology, where appropriate, to supporting learning goals; rather than being centred on the adoption of specific digital devices, tools, or platforms as a starting point.

Design Feature of Ontario's Approach: Collaborative Partnerships

Perhaps the most remarkable characteristic about Ontario's approach to advancing 21st century learning and teaching is its collaborative implementation. Indeed, Ontario's evolving, multi-phased 21st century learning and teaching strategy builds upon strong, positive and collaborative relations between the Ministry of Education and education sector leaders. It benefits from a culture of inquiry that has been actively fostered among its educators through various interrelated initiatives and efforts sponsored by, for example, the Teacher Learning and Leading Program (TLLP), which empowers classroom teachers to engage in authentic learning and share their expertise with colleagues.

Though 21st century learning, as an emerging public policy field, remains loosely defined (Jenson et al., 2010; OECD, 2012c) and in need of greater precision (Fullan, 2010), many stakeholders are championing change and pointing the way forward, including the voices of innovative Ontario classroom educators who engaged in the province's collaborative TLF 21st Century Innovation Research Projects. As Fullan and Langworthy (2014) express eloquently, and to which Ontario ascribes, "at the heart of most teachers' motivation is the desire to ignite learning in others, to kindle curiosity and creativity, and to light up the potential of the human

mind.” This kind of professional motivation is what powers Ontario’s innovation research projects.

Since the inception of the research projects, stakeholders and school board representatives have been engaged in dialogue to inform the evolving strategy. Roundtable events have provided opportunities for system leaders to discuss transformative practices in education, share key findings from innovation work, and learn more about 21st century learning and teaching practices from an international, provincial, and local perspective. Critical friend, and keynote speaker at the annual roundtable events Dr. Chris Dede (Harvard University), has provided valuable insight and perspective on Ontario’s progress, calling Ontario a “lighthouse” for others embarking on this journey of whole system transformation in digital learning. The TLF supports teacher, school and system leader capacity building and actively spreads effective innovative practices in learning and teaching across the system, honouring the principles of collaborative professionalism, which were recently formally outlined in Ontario’s Policy/Program Memorandum 159 (Ontario Ministry of Education, 2016c).

Design Feature of Ontario’s Approach: Evidence-Based

The focus on collaborative knowledge creation and exchange of effective technology-enabled practice that is evidence- and research- informed is a key design feature of Ontario’s approach. This disciplined approach is intended to accelerate awareness, uptake, and systematizing of promising practices in technology-enabled, 21st century learning and teaching in ways that promote the acquisition of important higher order global competencies. Classroom educators, as well as school and system leaders who participated in the project, approached learning tasks in new ways, applying professional judgment in changing pedagogical practices to leverage technology to improve student engagement, learning, and achievement. These educators have systematically documented their inquiry investigations and resulting impact evidence, sharing this knowledge openly with their peers and the wider provincial and international research community. In doing so, they fulfill an important expectation of transparency set by Ontario’s research initiative.

The approach is consistent with international research on effective strategies to foster education innovation. “Openness about one’s innovation is the second way in which horizontal systems of innovation differ from conventional modes of innovation. Freely revealing new solutions and ideas is a necessary condition for the functioning of communities of users. In these communities multiple potential sources of innovation are identified and each member of the community can benefit from them” (OECD, 2004, p. 49). Similarly, Dede and Frumin (2016) note that a strength of Ontario’s approach is that it “includes supports for capacity building and knowledge mobilization as a means for supporting teachers and school and system leaders in shifting their practices to integrate promising innovations that make a demonstrable difference for student engagement, learning, achievement, and success” (p.5).

Since the first round of Ontario’s innovation research projects in 2011-12, the international literature has expanded and deepened in the understanding of what is actually involved in the move toward learning and teaching, enhanced by technology (Curriculum Services Canada, 2016). Some Ontario school boards are part of international studies noted by Fullan &

Langworthy (2014) that also include countries such as Denmark, Australia, and England that are helping to inform a direction for education today. These researchers describe a commonality across countries in “the radical change in the relationships between all key players in learning: students, teachers, technologies, school cultures, curricula, and assessments” (as cited in Curriculum Services Canada, 2016, p.1).

Ontario educators and Ontario’s approach are contributing valuable insights and impact evidence in an emerging field, where, to date, the overall research evidence supporting claims for student benefits has been newly-forming, thin and/or on a small-scale. As Jenson et al. (2010), noted in a ministry commissioned policy scan, “Almost a decade since the 2001 publication of *Oversold and Underused: Computers in the Classroom*, Larry Cuban’s study of computer integration in California schools, research in the area of technology-enabled instruction continues to point to the same fundamental issue. Despite massive investment in digital technologies for education over the last two decades, there remains little evidence of its impact on student achievement. As well, the research consulted for this report points to inconsistent, uneven, and inconsequential implementation of ICT to advance the learning and teaching of 21st century skills” (p.11).

With the emphasis on evidence- and research-informed decision making, and the generation of local artifacts to illustrate what ‘21st century learning’ looks like in practice, Ontario’s approach seeks to address this knowledge gap on technology-enabled pedagogy. This contribution is powerful, particularly when one is reminded of the idea that education constitutes a realm where knowledge is little codified. As Hargreaves (1999) writes, “As a rule, the profession of teaching is not organised to keep informed of alternative approaches and solutions tested by others; instead they proceed by intuition and imitation of recognized practices in the repertoire of ‘master teachers’. There are only weakly developed mechanisms whereby communities of educational practitioners collectively can capture and benefit from the individual discoveries made by their members. Opportunities for regular knowledge exchanges between educational researchers and teachers are few and far between” (as cited in OECD, 2004, p. 31).

Video clips, board implementation artifacts, think pieces, research papers, keynote speeches and resources contribute to the knowledge mobilization goals of the TLF 21st Century Innovation Research Projects, and innovation theories of change and impact evidence are made visible to school and sector leaders in a variety of ways. Through the innovation research projects, a body of evidence now exists for how learning and teaching practices, enhanced by technology, is making a difference for students and how school boards are scaling these practices. As such, Ontario is both drawing from, and contributing to, the growing body of international research on deeper learning practices, global competencies and innovation scaling. Dede (2016) notes that Ontario’s theory of action and change for large scale educational improvement draws from and aligns with leading research, frameworks and practices, and is making a difference for student engagement, achievement and well-being. In fact, in Dede’s (2016) view, Ontario’s approach serves as a successful example for other jurisdictions interested in understanding effective strategies for innovation scaling for deeper learning and competencies, enabled and enhanced by technology.

Key Findings from Ontario’s TLF 21st Century Innovation Research Projects

2016-17 marks the sixth year of Ontario’s investment in local school board innovation projects designed to implement innovative learning and teaching practices, enhanced by technology, and third year of project funding through the formalized Technology and Learning Fund (TLF) program. With the announcement of the \$150M TLF investment, school boards were asked to focus their local innovation projects on at least one of the following four key areas of focus (based on research evidence) that support deeper learning for improved student outcomes:

1. Create more teacher-student learning partnerships and real-world, authentic learning tasks enabled by technology;
2. Provide more opportunities in school for peer-to-peer learning enabled by technology;
3. Provide professional learning about assessment practices that reflect deep learning pedagogy, aligned with *Growing Success*³; and
4. Develop new learning partnerships among educators enabled by technology in addition to face-to-face professional learning.

The development of these four key areas is based on the research, including that of Fullan and Langworthy (2014), who outline three key elements of *New Pedagogies for Deeper Learning* that align with and support the focus of the TLF: learning involves the creation and use of new knowledge in the real world (authentic, relevant, deep learning tasks); learning partnerships are developed between and among students and teachers that focus on the process of learning and assessment; and learning is enabled by access to digital tools and resources both inside and outside of school.

Since their inception, the local innovation projects have grown from involving 46 of 72 school districts, 646 schools and 39,000 students in Round 1 (2011-12) to full-system engagement in 2015-16 involving all 72 school districts, four school authorities, over 2300 schools, over 15,000 educators and more than 265,000 students. The strong growth in the number of students is a clear, quantitative indicator of the TLF’s provincial impact. Overall, the goals of the TLF 21st Century Innovation Research Projects continue to be supported by a consistent international perspective: to ensure that graduates are prepared for a competitive, connected, and technologically-engaged world.

Conceptual Framework and Methodology

An external research team from Curriculum Services Canada (CSC) reports on the overall and individual project results each year, applying a common research framework – case study methodology (Stake, 2005) – to gather impact evidence across all jurisdictions’ locally-determined projects. The research team built a conceptual framework based on models (OECD, 2009; Fullan & Barber, 2010) used to guide systematic study into technology effectiveness in education. Models that examine technology-enabled initiatives in education sometimes are limited in scope, are utilized over a fixed time, and result in a range of outcomes. The framework for this research investigation was broadly defined to allow for ongoing insight into the role of

³ *Growing Success* is the Ministry of Education’s assessment, evaluation, and reporting policy.

technology in changing teaching practice and in strengthening student engagement, learning, and achievement.

The research strategy was intentionally broad to enable collection of data from a diverse array of multi-faceted projects and to be adaptable for the various stages of development of technology-enhanced projects that school districts were undertaking (emerging, applying, integrating, and transforming). In building the framework, further consideration was given to the diverse contributions to be recognized within the study: French- and English-language school districts, urban and rural communities, Kindergarten to Grade 12 involvement, choice of technologies, areas of focus, and scope of the projects.

The framework provided a foundation for documenting school districts' diverse, locally chosen, and in some cases experimentally-controlled technology-enhanced projects, and guided school districts in reporting within a common research structure. The framework also supported the research team in analyzing data and identifying key findings across projects. The framework structure required school districts to identify potential implications for local and provincial policy and programming that were evident from project activities and to reflect on the systemic consequences of their projects on areas such as capacity building, knowledge mobilization, and leadership development. Throughout the research study, innovation participants were invited to join online communities of practice sponsored by the research team to promote the exchange of knowledge among researchers and teachers, as well as a means of gathering research evidence.

Since case study methodology (Stake, 2005) lends itself to the gathering of both qualitative and quantitative data, this methodology was used as a means of gathering and explaining particularities about individual projects, and also about what might be seen as common across projects. The data reported by school districts provided quantitative information about the scope and involvement for each project initiative and captured details for a rich qualitative description of the impact of technology on 21st century learning and teaching. This methodology allowed the research team to present a detailed picture of each site or case according to the comprehensive self-reporting guide supplied to project leaders and supported through webinar sessions, online discussions, personal interactions by phone, and in visits to a cross section of school districts where field researchers met and interviewed individuals attached to projects and visited classrooms to see technology in use. Descriptors of each round of innovation projects are included in the full research reports available at www.ontariodirectors.ca.

Regarding the latest round of innovation projects, the research team indicated that “Projects are increasingly applying processes that scale their work across the system, and are placing greater emphasis on district-wide implementation strategies rather than on isolated, tactical investigations of specific devices, approaches, or applications. It is clear that provincially, systems are mobilizing knowledge gained over the past Rounds of study to increase capacity, to continue to scale up technology-enabled learning and teaching, and to put in place the conditions necessary for sustaining this approach” (Curriculum Services Canada, 2016, p.4).

The external research team's data collection is supplemented by the ministry's separate data collection process, whereby data is collected from school boards using a self-reporting online tool and discussed through webinars with project leaders. Selected districts provided additional

information through interviews, and data is cross-referenced with provincial achievement data in some cases. The research team compiles themes emerging among districts with a view to facilitate knowledge mobilization and collective capacity building. Effective practices and artifacts are shared at annual roundtable events for leadership teams from all districts. Project impacts are monitored and assessed annually. The investigation is examining: evidence of changing practices for deep learning and strengthening of student engagement, learning, and achievement; how the projects' outcomes for student learning connect with global competencies; and effective innovations in learning and teaching practices, enhanced by technology, suited to system scaling and sustainability.

Overall, the external team's research focus is to gather solid evidence of the impact that learning and teaching, enhanced by technology, has on students, on teacher practice, and on the system. Researchers seek to understand the clear connections of technology-enhanced learning to student engagement, learning, and achievement – where the impact can now be evidenced, or, how it is anticipated in the future. The analysis and discussion which follows is based on data and impact evidence provided to the external research team and Ministry of Education by school boards over the first two years of Technology and Learning Fund. More specifically, the following section will delineate upon key findings from the most recent round of Ontario's local innovation research projects (2015-16) under three areas of impact: students, teachers and system.

Findings – Impact on Students

As stated previously, according to the external research team, in 2015-16 over 265,000 students, 15,000 teachers and 2300 schools across the province have been engaged in innovation research projects funded by the Technology and Learning Fund (TLF). The growth in the number of students to 265,000 in 2015-16 (up from 170,000 students in 2014-15) is a strong indicator of the TLF's provincial impact.

A significant pedagogical shift indicated by TLF data is the move to inquiry-based and authentic learning, enhanced by technology. Teachers are empowering students to inquire into their own driving questions, having them connect with their community and encouraging them to work independently (Curriculum Services Canada, 2016). As one teacher remarked: "I have become a facilitator of learning. I guide, and I steer, but the students are searching, striving towards knowledge, collaborating, sharing" (Curriculum Services Canada, 2016, p.39).

Boards are consistently reporting that this shift to inquiry is leading to greater student engagement and is playing a significant role in the development and improvement of global competencies, learning skills and work habits focused on deeper learning. Some projects reported on achievement measures pertaining to skill development using technology and others reported on gains in the learning attributes central to digital learning. There is evidence of an increase in achievement due to the focus on global competencies, utilization of technology, and student inquiry (Curriculum Services Canada, 2016). The descriptions of achievement provide evidence that teachers and system leaders are thinking more critically and deeply about ways to confirm that student achievement can be measured on a scale commensurate with that being used to report student engagement and learning (Curriculum Services Canada, 2016).

TLF data indicates that students often embrace technology with enthusiasm and assist as co-learners – with teachers – in finding out new ways to maximize the technologies’ potential for learning, and school boards report that students are keen to use technology to engage with curriculum expectations in new ways. Student engagement is increased by learning experiences that promote student voice and choice. For example, students are empowered by access to a wider range of resources – including experts, other learners, and global projects – for deeper exploration, enabling them to have more choice in their learning (Curriculum Services Canada, 2016). In some cases increased student engagement is measured by actual improvement in student attendance. The data also indicates that there is also increased engagement among parents about their children’s learning and an understanding that connecting with the parent community enabled by technology is a way of building a network for student success beyond the wall of the school (Curriculum Services Canada, 2016).

In addition to student engagement, technology is actively facilitating student learning and understanding, and boards are using technology to enable students to become active participants in setting their own goals, managing their own learning, and assessing their own progress. One student said: “By learning this way, we’ve taken on real world problems – I’ve never done that before...And, we had fun learning ... instead of doing work that we’ll never use, we actually put it into good use, and we made a difference” (Curriculum Services Canada, 2016, p. 34). Students indicate that increased access to wireless digital tools in their classroom improved their ability to learn and school boards report that student assignments are demonstrating greater depth, quantity and quality of work when using technology as well as increased efficiency and effectiveness in completing assignments and meeting deadlines. Throughout the province, educators cite examples of improvements in both the quality of learning taking place in classrooms, and the impact that technology is having on students individually and as a group (Curriculum Services Canada, 2016).

To a certain extent, the inclusion of technology, and technology-enhanced learning, into the curriculum is also advancing equity. Through TLF projects, boards are supporting groups within their student population that typically face barriers to learning or are underrepresented within the larger population, such as, students with special education needs; English language learners (ELL); French language / Francophone communities; girls in science, technology, engineering and math (STEM); boys with reading and writing; and learners from remote communities. For example, TLF projects have provided differentiated (personalized) learning and removed barriers so that students with special education needs can express and demonstrate their learning in ways they couldn’t before using multiple modalities. Tablets and apps along with training are being provided to ELL teachers to provide support to ELL students who have unique literacy/numeracy needs. Boards report that technology has “levelled the playing field” for these students leading to increased student achievement. Technology-enhanced learning is also playing a significant role in removing stigma for students who rely on assistive technologies. The external research team found that 35% of the latest round of innovation projects identified that supporting students with special needs or examining the requisite assistive technologies was a significant aspect of their initiative (Curriculum Services Canada, 2016). One teacher commented, “The widespread availability of technology in its many forms has allowed students to see themselves as learners and not as ‘special needs’ learners...Technology has been pivotal in equalizing the playing field for our students”

(Curriculum Services Canada, 2016, p. 36). There is a clear trend that students with learning difficulties have been able to engage in the same learning experiences as their peers, using appropriate digital supports while working at different levels of engagement, and that students with diverse learning needs are more willing to share their ideas.

Technology is now being used more as a learning tool rather than only as a teaching tool and a visible shift in students' attitudes toward the process of learning and a growing eagerness to be involved in learning using multiple technologies is evident. Overall, there is a consistent focus on the process of learning enhanced by technology, with teachers reporting higher engagement, task completion and increased engagement and success through encouraging student inquiry (Curriculum Services Canada, 2016).

Findings – Impact on Teachers

TLF data indicates that as a whole, school boards are noticing that there are strengthened efforts to enhance the use of collaborative processes in learning and teaching. There is increased teacher-student collaboration and teachers are building learning partnerships with students, by supporting student voice and input in their learning (Curriculum Services Canada, 2016). This finding supports a notion put forward by the authors of *Shifting Minds 3.0: Redefining the Learning Landscape in Canada (2015)*, that: “learning is a social process, with teachers and students working together in partnership with each other and with experts beyond school, supported by digital technologies (as cited in Curriculum Services Canada, 2016, p.12).

Through their innovation projects, teachers are engaging with one another, and developing action plans to address pedagogical questions that they are grappling with as part of their teaching practice. Teachers are also reporting that this collective learning process is of great benefit to them as they continue to iteratively innovate and refine new learning and teaching practices. The external research team also reports that the use of technology is a catalyst for building collaboration and communication among students and teachers. Findings from the most recent round of the local innovation projects indicate that 29% of them targeted collaboration and communication and 61% addressed at least some of Ontario's six draft global competencies (Curriculum Services Canada, 2016). In fact, the latest round of projects indicate that not only is there positive acknowledgment at all levels of the education system that the competencies needed to thrive in the 21st century are those noted in the international literature, but also that teachers are asking for ongoing professional learning to further develop their instructional practices around competencies (Curriculum Services Canada, 2016). Boards are realizing that innovative pedagogical practices enhanced by technology go hand-in-hand with the desired development of students' global competencies.

In terms of assessment, data indicates that using technology is allowing teachers to deepen assessment practices and is having a direct and timely impact on their teaching practices and the students' learning opportunities. The use of cloud-based platforms, for instance, allows for ongoing opportunities to provide feedback to students. Research on effective teaching, deeper learning and global competencies all point to the critical importance of formative assessment and timely, descriptive feedback for student engagement, growth and achievement. The data indicates that technology is allowing for the deepening of assessment practices, highlighting feedback during the learning as a way of thinking about assessment as part of the learning

process (Curriculum Services Canada, 2016). On teacher remarked: “I found that [technology] helped me with seeing the overall process of students’ work. [I could see] the times the students revised their work, [how I was allowing] opportunities for students to collaborate to solve problems as well as providing different ways for students to figure out which way of learning works best for them” (Curriculum Services Canada, 2016, p. 40). Another educator noted, “It’s great to see the work in progress but also to see how that shaped their final project ... The assessments are now focused less on content and more on thinking” (Curriculum Services Canada, 2016, p.41).

There is also significant evidence that teacher efficacy is improving with the use of technology [(e.g. tablets, virtual learning environment (VLE), Google Apps for Education (GAFE)] as well as their confidence in designing innovative learning and teaching practices with these new technologies. Teachers are becoming more comfortable with, and motivated to, use technology and to explore various ways of incorporating technology into their pedagogical practices, including student voice. Teachers are open to using technology for professional development, and more comfortable connecting with one another and learning together about changes in pedagogy and technology. It was noted earlier that 26,000 teachers were involved in professional learning (PL) in 2015-16. Following professional learning sessions, one teacher said: “I now feel that when I am using technology in the classroom, it is more purposeful. I have a deeper focus and now know of more ways to connect the curriculum to the real world via technology” (Curriculum Services Canada, 2016, p. 42).

The Council of Ontario Directors of Education (CODE) has also noted that the quality and focus of professional learning for teachers has improved under the TLF, moving from the use of technology to changing the learning and teaching stance, including putting student learning styles at the forefront of decision making. They also noted that professional development linked to innovation has grown significantly, with teachers, principals, superintendents and directors all involved in professional learning activities, with a trend to more job-embedded strategies like collaborative inquiry and differentiated approaches for professional learning. The shift marks a change in innovation and capacity building among teachers and is in line with an important OECD (2016) finding that, “the efficacy of technology-supported models comes largely from the pedagogy that it supports: teachers need the resources and understanding of how to use them” (p.110).

Findings – Impact on System

The strong, positive and collaborative relationship between the Ministry of Education and education sector leaders is leading to success for large scale education improvement in Ontario under the Technology and Learning Fund (TLF). On the point of scaling, the modest investment of the TLF so far relative to the overall education funding of almost \$23B is already showing significant impact and serving to leverage wider resources and transformational change at scale well beyond the dollar value of the TLF investments. The jump by almost 100,000 students from 170,000 students in 2014-15 to 265,000 students in 2015-16 cannot be understated.

There is evidence of concrete direction emerging in terms of sustainability and scalability that capitalized on the convergence of pedagogy and technology. In particular, progress has been

visible across these phases: establishing infrastructure and exploring new practices; aligning strategic plans and scaling; and articulating a clear vision in terms of technology enhanced learning and teaching at all levels while focusing on student growth. While all boards in Ontario are voluntarily engaged in the collaborative innovation research investigation toward the shared goal of transforming education for deeper learning and global competencies, enhanced by technology, individual boards are at different places along the three phase progression toward exemplary practices in innovation scaling.

Systemizing and scaling innovative learning and teaching practices enhanced by technology use includes the importance of designing ongoing professional development at multiple levels; school district departments working together; and policy development that promotes sustainability and scalability. These findings affirm a critical insight from the OECD (2016), that technology's adoption is most likely to be sustained and effective when there is adequate support from policy makers; as well as Fullan's (2010) capacity building model, which outlines four elements - direction; collaboration; deepening learning; and accountability – in a circle of simultaneous and continuous change activated and connected by leadership.

On the point of leadership, there is a growing understanding that leadership is the key to scaling innovative practice, with principals reported to be playing a vital role as instructional coaches and that they are developing technical fluency with system tools. Data indicates that the increase in technology use has motivated the development of new district technology policies, and school districts are developing renewed plans to assure that ultimately, all teachers and students have access to, and learning opportunities about, safe, responsible and effective use of digital tools.

The external research team has made clear that because of the TLF, school boards are now at a point where they are well-prepared and ready to take the transformation across their entire system to the next level. For example, a number of projects are adopting frameworks that embody new directions in technology-enhanced learning and teaching, e.g. Substitution, Augmentation, Modification and Redefinition (SAMR) and Science, Technology, Engineering, Mathematics (STEM). School boards are acknowledging that they have made progress towards realizing the TLF goals; however sustained work is still required to realize an impact on student achievement and well-being.

The data points to a paradigm shift around the importance of moving projects from classrooms and schools to whole system learning and aligns with recent literature and thinking regarding the cultural shift in embracing system change, including that of Fullan and Langworthy (2013): “When there is this kind of system-wide shared purpose, collective will becomes the core driver, and change becomes much easier than previously thought... This orientation toward system-wide diffusion of new pedagogies begins with cultural coherence and initial engagement, and then brings in tools and programs to support realignment” (p.7).

Overall, there is solid evidence that school districts are solidifying their vision and basing their planning and actions on an increasing body of research literature about digital learning and teaching and the central importance of global competencies. It is evident that most school boards, school authorities and provincial schools in their second year of Technology and

Learning Fund (TLF) implementation are already meeting a key goal of *Achieving Excellence*: the development of new innovative practices for learning and teaching enhanced by technology. Systems are focused more on the human impact of change, such as support for teachers and on building bridges between and among different board personnel in order to provide a more coordinated platform for learning and teaching, enhanced by technology, across the district. Through the TLF, capacity building and knowledge mobilization are shifting practices to integrate promising innovations and are making a demonstrable difference for student engagement, learning, achievement, and success.

Foundational to the success of the whole initiative over the five rounds is the change from viewing technology separately from pedagogy, to one where teachers and systems understand that pedagogically-driven and technology-enhanced learning and teaching is a key factor for student success in the global knowledge economy and society. This powerful finding reflects Fullan's perspective (2012) that pedagogy, technology, and change are three main drivers needed to move education forward in the 21st century. School districts and schools have moved beyond experimenting with various digital tools and programs in classrooms as a means of incorporating technology into isolated elements of the program, to a deeper understanding of what the shift toward 21st century learning and teaching means holistically for an education system. Indeed, this is perhaps the most significant finding reported by external research team, regarding the impact of Ontario's \$150 investment in advancing 21st learning and teaching: that the province has solid evidence that school districts across Ontario are now at an inflection point where students, teachers, and systems are experienced and equipped with the digital milieu to take technology-enhanced learning and teaching to the next level (Curriculum Services Canada, 2016).

Conclusion

If one thing is clear, it is that the dynamic and unpredictable nature and scale of changes in civic society, technology, knowledge creation, innovation, and the global economy - together with changing expectations and capacities of learners themselves - call for sustained capacity in education systems to adapt and innovate continuously. To that end, the work of transforming education for changing times is more a process and journey than a destination, and Ontario continues its disciplined learning journey through a multi-phased, multi-year approach to focused innovation and defining a 21st century learning and teaching plan for the province. This paper presents evidence of the province's successes in engaging the education system as a whole since 2011 to build innovation capacity and commitment toward a shared understanding of what is required to equip young people for living, learning, working, and responsible citizenship in a dynamic and complex knowledge- and technology-intensive world.

Ontario's collective and system-wide engagement of all education partners involved in professional risk-taking, innovation, and knowledge creation in leveraging technology to improve the instructional core, has fostered a dynamic process of continuous professional learning, engagement, and optimism for learning. The research findings profile growing momentum in all school districts to embed the transformational forces of pedagogy, technology, change knowledge, and change leadership that mounting research evidence associates with effective 21st century learning and teaching practice (Dede & Frumin, 2016; Fullan, 2012; Fullan & Langworthy, 2013; Hargreaves in Ballanca et al. 2010; OECD, 2010, 2012b).

There is energy and optimism in school districts, schools, and classrooms across the province for this innovation effort, building on a vibrant culture of inquiry in the Ontario teaching profession. In the words of one school principal, "Now with technologies and with the right learning environment students and teachers are learning together and when they learn together they create knowledge and meaning that is more creative, more powerful, and more motivating than traditional types of learning. This kind of learning, this kind of excitement and motivation takes our students not just from our classroom, not into our community but it takes them across the world" (Curriculum Services Canada, 2016, p.7).

The momentum for innovation across the sector that has been engendered through the TLF 21st Century Innovation Research Projects and captured through the research study continues in Round 6 (2016-17). Moreover, it serves as a strong foundation for future reforms, much of which will revolve around global competencies, as Ontario moves forward on preparing students to thrive as personally successful, economically productive and actively engaged citizens in the societies and economies of the 21st century.

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