

Pillars of Technology Implementation:  
Asking the Questions That Lead to the Successful Integration of Technology  
into Public School Settings

by

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Bachelor of Education, University of Victoria, 1993

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of the Requirements for the Degree of

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## **Supervisory Committee**

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### **Supervisory Committee**

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## **Abstract**

The integration of technology into the classroom has garnered significant attention at all levels of public school systems across the Western world in recent years. The growth of technologies that connect people to all the information the world has to offer at the touch of a button, has forced educators to consider how technology is changing teaching and learning. This project looks at the necessary questions leading up to the implementation of technology in the classroom. These questions are the pillars upon which the use of technology for education can be successfully built. The pillars are leadership, teachers, curriculum and resources, and professional development. Each pillar represents a distinct part of a good Technology Integration Plan and together they create the pedagogical synergy necessary for the successful implementation of technology into the classroom.

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## Dedication

I would like to dedicate this Master's degree to my wife Clara, without whom I wouldn't have been able to complete this Master's on time or on budget. Her continuous love, support, patience, and bewildering tolerance of my innumerable faults, has made my life and this Master's program far easier than it would have been without her. And to my long suffering parents, who had to endure my academic failures, tutors, summer school, and praise-less parent teacher conferences... They believed that I wasn't the dullard everyone made me out to be and for that I thank them.

## **Chapter One: Theoretical Framework**

### **Personal Context**

I have been working with technology since day one of my career, which began in a small two room schoolhouse in rural BC in 1995. Over the years, I have had the opportunity to accumulate a wealth of experience and a sack full of opinions when it comes to the integration of technology in education. It is with this backdrop, that this project has been created.

For all the progress I have seen in the evolution of educational technology, I have been witness to a number of technology initiatives that have fallen to the wayside. One does not need to look far to find a school system where the implementation of technology has met with unmitigated failure or at the very best half-hearted acceptance (Chambers, 2014). I have had a front seat to a number of technological failures over the years myself. The two most significant having been the demise of the Nautikos Learning System and the Safari Multimedia system. Both failed for different reasons but illustrate the two most common reasons technological integration fails: 1) inability of the vendor to deliver the goods and 2) obsolescence.

With Nautikos, cost overruns and constant delays in delivering an operable product resulted in customers moving on to other content delivery solutions and the business ultimately crumbled. The Safari Multimedia System simply died a classic technological death that all hardware eventually succumbs to in that it was obsolete before it was installed and switched on. For all the tens of thousands of dollars spent on both of these examples, most teachers felt there was not much gained on the learning front, serving only to add to the resistance teachers have shown in implementing new technology into their classrooms.

The most recent and perhaps spectacular technology implementation failure in a school district was the iPad program in the Los Angeles public school system. It would seem that everything that could go wrong did go wrong in Los Angeles: inappropriate tendering of contracts, misappropriated funds, software that did not work, questions around safety of students who could be targeted for carrying valuable devices to and from school, lost and stolen devices, along with Wi-Fi connectivity issues. By all accounts, Los Angeles is now the poster district for how not to integrate technology into a school system Gilbertson, (2014).

In this chapter, I will discuss the problem around technology implementation in education, our current context and future directions, and will close with an overview of my project. Throughout this project, I will often refer to the term “technology” and define it as tools, machinery, or software which can aid an individual in improving or expanding their ability to think, communicate, or create.

## **Technology Implementation in Education**

**Problem statement.** The implementation of technology for any organization can be fraught with complications. Training employees, sourcing the right hardware, and ensuring your existing infrastructure is up to the task are a few variables to consider. In addition, the time, effort and costs associated with implementing new technology into any large organization can be problematic at best.

For all the promise of a new technological age in education, schools around the world struggle with how to effectively implement new and innovative learning technologies. Heading up the list of problems is funding these technological advances in the face of shrinking education budgets, closely followed by figuring out what technologies to invest in, providing timely

training for educators, and last but not least creating a collaborative decision-making framework to guide the implementation.

It has been my experience that implementation failures both big and small can occur for any number of reasons but most frequently, in the education world, it is the result of one or more of the following issues. Each of which the literature review will expand upon.

- psychological considerations
- government policy
- curriculum and resources
- professional development

The question is, what needs to be done to ensure that a school's technology implementation plans are successful? Canadian governments both provincial and federal have been pondering this for quite some time (Ontario Ministry of Education, 1998; British Columbia Ministry of Education, 2001), but it would seem we are still having the same discussions in 2015

**Historical background.** In the past, technology implementation was simply an act of buying the equipment that was needed for the teachers that needed it. Technology had its place and it remained within the walls of the classrooms where it was used. It was easy and efficient. Give the technology to those who can use it and walk away. It allowed for some pretty cool things to happen in those classrooms, but rarely did any of the technological innovation that occurred in those classrooms spread to any other parts of the school.

This type of technological implementation is what is referred to by some as the "Islands of Innovation" and it worked very well for those who sought to integrate technology (Avidov-Ungar, & Eshet-Alkakay, 2011). Technology was distributed to those who needed it, it was

controlled within a specific type of classroom environment, and it was business as usual for everyone else. Overall, this model fails, however, to support a pervasive integration approach.

**The current state of implementation.** Today, information technology is no longer compartmentalized or controlled by a handful of teachers. With the proliferation of smartphones and other portable devices, access to the power of computing is not restricted to what a school can provide any longer. Although digital devices in the hands of all students has not yet become ubiquitous, In a 2013 PEW Research Report by (Purcell, Heaps, Buchanan, & Friedrich) involving 2,462 American teachers, it becomes clear that student access to digital devices is not isolated or unusual in today's classroom. They report that

- 73% of teachers and or students use mobile devices to complete assignments in class.
- 79% of teachers have students access assignment online and 76% have students submit assignments online.
- 18% of teachers say that all students have access to digital devices at home.
- 54% of teachers say that most students have access to digital devices at home.

(p. 1-2)

It is obvious from this report that there is not yet a digital device in the hands of every student, but it does illustrate the need try and create some equity of access amongst students in all subject areas, rather attending to the needs of a few specialized classroom environments.

Unfortunately, many school districts in Canada are struggling to implement new technologies in a cost effective, pedagogically sound manner (MacDonald, 2014). As an example, a province like British Columbia has 60 school districts, so with no Ministry implementation plan to go by, what results is that 60 different implementation plans are being created and put into action. This means 60 different funding structures, 60 different implementation committees, 60 different hardware choices, 60 different software choices... The

amount of duplication in time, effort, and money is staggering. With this kind of multiplicity, there is an increased chance of inequity in what the individual learner experiences, in what is supposed to be a fair and equitable public school system.

Another curious aspect to the implementation of technology in Canadian schools is the lack of current curriculum and resources to go along with the 21st century technology. Many of the provinces have not updated technology-related curriculum since the mid to late 90's (see Table 1). What we seem to fail to realize is that curriculum directs instruction. If our curriculum does not call for, outline, direct, or guide the use of technology in instruction, chances are the integration of technology into our teaching will fail to materialize. What teachers are left with is a situation where schools are being asked to hurry up and become state of the art, with little to no support to do so or direction to go by.

**So what are we to do?** A retired colleague used to say to me, "The further away from the classroom that a decision about education is made, the worse that decision is!" I cannot disagree with this statement, but I think one of the biggest problems we face in making implementation decisions with regard to technology is that far too often, those implementation decisions are done on a classroom-by-classroom basis. There needs to be Ministry and District leadership providing direction, while at the same time having those decisions being infused with bottom-up collaborative input. Without an implementation plan in place, there will continue to be an extraordinary amount of waste in time, money, and effort in school districts throughout Canada.

Table 1

*Most recent ICT curriculum update by Province and level*

<b>Province</b>	<b>Primary</b>	<b>Intermediate</b>	<b>Senior</b>	<b>Curriculum Status</b>
British Columbia	1996	1996	2004	Released a Digital Literacy Framework in 2013. No new curriculum.
Alberta	2003	2003	2003	No new provincial programs of study have been developed at this point in time.
Saskatchewan			2010	All curriculum is under review under the new Education Sector Strategic Plan (ESSP).
Manitoba	2006	2006	2007	No response
Ontario	2007	2009	2008	Newly revised curriculum documents include role of ICT in that subject area.
New Brunswick	2001	2001	2001	No Response
Nova Scotia	2014	2014	2001	Currently using the P- 6 ICT Outcomes that were released in 2013.
PEI	2005 - 2010	2005 - 2010	2005 - 2010	No Response
Newfoundland		1990's - 2012	1990's - 2012	In process of writing a K-6 curriculum resource guide.
Yukon	Uses BC Curriculum	Uses BC Curriculum	Uses BC Curriculum	No updates
Nunavut	2014	2014	2014	No response
NWT	Uses Alberta Curriculum	Uses Alberta Curriculum	Uses Alberta Curriculum	No Response
Quebec	2001	2004	2004	Currently not working on new ICT curriculum.

## **Project Overview**

**Purpose.** The primary goal of this project is to create a four pillar approach to effectively implementing technology into the classroom. It will look into how the psychology of change, governmental practice and policy, curriculum and resource development, and professional development can have a significant bearing on whether or not the use of technology is successfully adopted by a learning community or not. The purpose of this project is to assist educators in making change as it relates to technology in education. The product will be a practical guide that can be followed at all levels within an education system.

1. Research question(s).What is the role of the teacher in integrating technology into the classroom?
2. How are provincial governments approaching policies and curriculum development for the integration of technology into public school settings?
3. How does curriculum and provision of resources influence technology implementation?
4. What is the role professional development in technology implementation plans?

**Project description.** The product of this project is a practical guide that provides a simple framework around which educators and administrators can assess their existing technology plans or begin to build effective technology implementation plans for the classroom, school, school district, or entire public school system. This guide has come about through the distilling of current research on the adoption of technology in educational settings. By focusing on what will be referred to as the Four Pillars of Implementation, this project hopes to bring clarity into the process by which we introduce technology into the classroom.

**Search methods.** The research methods employed for this project revolved around the use of Google Scholar to find relevant academic journal articles and books on my research topic and then going to the University of Victoria library and ERIC to access to the particular document I was looking for. If my search lead to a book, which I did not have access to through the University of Victoria or ERIC, I would check my local library to see if they had it in their collection or I purchased or rented the book through Google Books.

My keyword list evolved over time as finding relevant research was not always as straightforward as I had hoped. The following are my keywords that I used in a variation of boolean logic strings:

Education technology - Edtech - Technology implementation - Psychology of change - change theory - professional development - education policy - curriculum development - technology policy in education - ICT in education - funding ICT in education - computational thinking in education - ICT resources - teaching ICT - collaborative decision making in education - Adoption of technology in education - barriers to technology in education - obstacles to technology in education Finland ICT education - Korea ICT education - Korean education master plan.

## Chapter Two: Literature Review

*As technology advances, it reverses the characteristics of every situation again and again. The age of automation is going to be the age of 'do it yourself.'*

- Marshall McLuhan (McLuhan & Zingrone, 1997, p. 184)

It has been 55 years since Marshall McLuhan made this prognostication and it would be safe to say that technology has enabled many people to become do-it-yourself learners. From teaching oneself to play guitar, to learning to code, to home renovation... technology has enabled people to do things that were once previously inaccessible to the lone learner 55 years ago, but for all the advancements in technology, do-it-yourself learning does not seem to have reached the classroom as of yet. 55 years later and most classrooms still do not look all that much different from a 1960's classroom. Although McLuhan's words are slowly coming to fruition, it is unlikely that today's classroom would meet McLuhan's 1960 vision of what education would look like in 2015. As change relates to technology in education, there are a number of reasons why our vision far outpaces our reality. This chapter will look at four of the most significant reasons why we struggle to implement technology in the K to 12 school system.

### **Theoretical Framework**

George Bernard Shaw once said, "*Progress is impossible without change, and those who cannot change their minds cannot change anything.*" Yet as much as humanity strives to "progress," there are always those who do not want to change and this can be linked to our desire for stability in our lives. Organization theory suggests that our aversion to change drives us to create organizations to maintain the stability we desire: "The standard literature for organization theory, based in part on sociology and other related disciplines, emphasizes stability and not

organizational change” (Burke, 2013, p. 53). Only when we understand and address the fact that people resist change and organize themselves in an effort to create stability, can we improve the chances of realizing change. This is especially important when trying to bring about institutional change such as implementing technology into a school system.

Change theory tells us that in order for change to come about, preconditions must be met. Fullan (2007) refers to this as change knowledge, and champions taking this knowledge one step further in creating theories of action that can bring about the desired change. Fullan is specifically interested in theories of action as it pertains to the implementation of technology in the classroom.

*Change knowledge enables us to more accurately assess whether a particular new thing is worthwhile or not. Making this judgment means getting inside the change process.*

*Fortunately, we know a lot about the process of change, and this knowledge is essential any time we are around technology. (Fullan, 2013, p. 66)*

Making change within the education system has proven to be rather difficult for a variety of reasons. (Risquez & Moore, 2013; Cohen & Sherman, 2014). This is why being familiar with change theory as it relates to creating an action plan is so critical. Fullan’s work around change in education is particularly apropos for this project because it acknowledges that there are many aspects of the learning community that must be addressed in order to bring about meaningful change. Fullan (2007) identified seven core premises that guide our use of change knowledge.

1. A focus on motivation
2. Capacity building, with a focus on results
3. Learning in context
4. Changing context

5. A bias for reflective action
6. Tri-level engagement
7. Persistence and flexibility in staying the course. (p. 8)

It is within the framework of these seven premises of change knowledge that this project will be developed.

### **Factors for Implementing Technology Into the Classroom**

**Preparing learners for the 21st century.** We often hear the argument that we should be implementing more technology into the classroom because our children need to be ready for the 21st century. In a 2007 survey commissioned by Partnership For Twenty First Century Skills it was found that “An overwhelming 80 percent of voters say that the kind of skills students need to learn to be prepared for the jobs of the 21st century is different from what they needed 20 years ago” (p. 4), but the problem here is that many equate 21<sup>st</sup> century employment skills with a simple utilitarian use of technology. Doing a quick Internet search using the keywords: 21st century employment skills will produce a number of websites that provide a list of important skills for employees in the 21st century. Although there are a number of variations on what 21st century learning skills are, one organization called Canadians for 21st Century Learning and Innovation (C21 Canada) published a document in 2012 that provided an excellent list of what we can consider 21st century learning skills:

- Creativity, Innovation and Entrepreneurship
- Critical Thinking
- Collaboration
- Communication
- Character

- Culture and Ethical Citizenship
- Computer and Digital Technologies

The specified use of “technology” as a skill in this list is only a small part of what C21 Canada suggests that students need to be able to do or have at their disposal. Kivunja (2014) takes a look at the “Pedagogical Paradigm Shifts” that will be required to make students 21st century ready and stresses that it is not just about using technology:

*While computers and digital technologies play a central role in the development and utilisation of the skills, the more essential skills for the 21st Century learning and occupations related not just to the application of technology but more importantly to the ability to engage in independent critical thinking, and a high level of problem solving, often using technology. (p. 81)*

Education technologists understand that 21st century skills are not focused only on direct use of technology, but being able to make choices about using technology well. This will help individuals leverage a whole host of other skills needed in a new era of learning and working. To further support the notion of 21st century skills being more than technology skills, Kivunja points to McCain (2005) and his book, *Teaching for Tomorrow: Teaching Content and Problem-Solving Skills*, where McCain criticizes historical thinking “that the answer is simply to equip students with up-to-date technology skills. Technology skills are important, but they are not enough” and that we need a “fundamental shift in the way we present material to students” (p. 86). This speaks to the need to teach students not to be simply technology users but to be critical, creative thinkers that collaborate and communicate using the technology of the day.

Educational technology integration advocates suggest that media literacy should be a core competency for any 21st century learner (Hicks & Turner, 2013). Mihailidis and Thevenin (2013) take the notion of core competency even further in their paper, *Media literacy as a core competency for engaged citizenship in participatory democracy*. The title of their paper suggests that “media literacy” and, by default of association, use of technology, goes way beyond just improving learning. It is or has become the foundation of good citizenship:

*The ubiquitous media landscape today is reshaping what it means to be an engaged citizen. Normative metrics for engagement—voting, attending town meetings, participation in civic groups—are eroding in the context of online advocacy, social protest, “liking,” sharing, and remixing. (Mihailidis & Thevenin, p. 1611)*

Mihailidis and Thevenin further point out that although traditional forms of citizenship “still have a place in the framework for “good citizenship,” they are increasingly distant from the reality of what participation looks like for societies increasingly linked by media technologies” (p. 1611).

If educators accept that their role is to prepare students for active citizenship and that a new age of citizenship driven by technology is upon us, then it stands to reason that educators should be taking into consideration how their teaching practice and/or curriculum needs to change in order to address the new definition of engaged citizen. To that end, the most pedagogically utilitarian thing that comes from this paper is what Mihailidis and Thevenin (2013) refer to as their “three critical media literacy outcomes” that educators should be fostering in learners:

- Critical thinkers
- Creators and communicators
- Agents of social change (p. 1614)

Although the interest in critical thinking predates the emphasis on technology integration (Craven, 1966; Lehmann, 1963; Gal, 1970), it would be hard to argue that the nature of the information we are thinking critically about has not changed. Digital media has changed how information is delivered, therefore, how people think critically about that information has to change as well. Citizens must be able to critically assess and analyze a constant and diverse stream of information on which to base their democratic participation (Mihailidis & Thevenin, 2013). Because the nature of information today and how it is delivered is so fluid, how we think critically also needs to be fluid. Mihailidis and Thevenin go on to say that “A truly participatory democracy relies on citizens’ efforts to develop and share their unique perspectives on societal issues, as well as developing new approaches to creating and circulating these perspectives” (p. 1615).

The skill of being a creator and communicator in a digital world now has far greater implications than just flexing one’s social influence on media networks. Bill Gates’s prophetic 1996 claim that “content is king” is now one of the undeniable truths of the Internet. To be successful within the digital medium, content needs to be good, useful, and relevant. If you create it, they will come. What we need to understand is that this skill of digital creator and communicator goes beyond commercial purposes and espousing the wonders of the next great gadget. What one creates and communicates digitally has become an indivisible part of their person. It is called one’s digital persona and increasingly it is used as a measure of one’s value as a student, employee, and can even define who you are as a flesh and blood person (Fong & Mar,

2015; Singer, 2013). If what Mihailidis et al., are saying about the way we communicate, create, and participate with the content and people we encounter online is true, then it may be a good idea to give digital communication some attention within our schools.

**Individual-level factors influencing technology adoption.** In a 2013 study, Risquez and Moore explore the feelings of faculty and staff regarding technology integration in higher education. They looked at the psychology of why some people are early adopters and innovators using technology and why others resist the adoption of technology. They drew heavily on Jungian psychology and try to look at how “individual responses to organizational change can be interpreted through the psychoanalytical concepts of individuation and congruence” (p. 326). The notion that resistance to the adoption of technology into the classroom as a psychological response, could change how most educational institutions go about implementing technological change. It would only seem prudent to take into consideration teachers’ attitudes toward technology. As Risquez and Moore (2013) point out, these attitudes are rather complex:

*Attitudes of teaching staff to technology enhanced learning are likely to result from a complex and multidimensional integration of social, contextual and individual factors. Important considerations include: how centrally driven the change is; the type of support and rewards provided to casualty; the emphasis that is placed on research or teaching roles; and professional identity issues... We can reasonably anticipate some reasons for resistance from a teacher perspective, including technical and pedagogical competence.*  
(p. 328)

These concerns of educators are very real and worthy of our attention. For any technology integration initiative to work, these concerns need to be addressed. The interesting part of the Risquez and Moore (2013) study is their focus on the effect of individualization vs.

congruence on the adoption of technology in the education setting. “The questions of individual freedom and responsibility are important in the context of organizational change” (Risquez & Moore, 2013, p. 330).

See Table 2 as the archetype of the individuation-congruence change framework by which to view an individual's readiness for change within an organization.

---

Table 2

*Archetypes of the individualization-congruence change framework*

---

<b>Congruence Individualization</b>	Low	Medium	High
High	The Rebel	The individualist	The pioneer
Medium	The sceptic	The undecided	The engaged
Low	The Detached	The ambivalent	The dependent

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Adapted from “Exploring feelings about technology integration in higher education,” by Risquez, A., & Moore, S., 2013, *Journal of Organizational Change Management*, p. 331.

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It is not hard to look at this table and start to match people to an archetype, but the question becomes, how is knowing this information helpful and what can be done about it once individuals have been labeled? Is a feeling of personal responsibility to change all that is needed? If so, how do we get all staff to the point where they feel this responsibility to change? This feeling of personal responsibility to change is a part of the Jungian psychology used in Risquez and Moore’s (2013) study and adds to the discussion of why certain individuals implement technology while the larger group tends to avoid or be suspicious of this implementation.: “The Jungian psychoanalytic framework puts emphasis on the value of individual freedom and

responsibility as a counterbalance of defensive and unproductive group dynamics” (p. 330). By focusing on the role of the individual, there are negative consequences for large group dynamics and their acceptance of technology, as “Jungian theory emphasizes the notion that every individual is unconsciously “worse” when in a large group” (Risquez & Moore, 2013, p. 330).

For the most part, the Risquez and Moore (2013) study makes a very reasonable argument that individual psychological factors and feelings need to be considered for organizational change. They report that those who have embraced the use of technology in this setting feel as though they have been given the freedom to do so. Where this study has a weakness, in considering classroom practice, is with their findings around the feelings of individual responsibility to make change. The notion of responsibility to make a change is understandable, but where this becomes problematic is when the change is in conflict with the teacher’s perception of what is best for the student(s). A teacher’s concept of what their role is (teacher agency) becomes the framework by which they view change (Lasky, 2005; Priestley, Biesta & Robinson, 2012). Greer (2014) points to Brownlee and Berthelsen’s earlier (2006) work that stated “an individual’s personal epistemic beliefs reflect how the individual considers the nature of knowledge, how one acquires knowledge, and the degree of certainty with which knowledge may be held” (p. 5).

The struggle that is faced, when attempting to integrate technology into the classroom, is there is a genuine feeling in some teachers that the connection between powerful learning environments and learning technologies is false and that “*powerful learning environments ... can as well be created without technology, and powerful learning technologies can be used in a way that does not result in powerful learning environments*” (Gerjets & Hesse, 2004, p. 448). It is from this place that many educators approach their practice. They subscribe to a belief system

that technology does not necessarily result in better learning outcomes and that powerful learning environments existed long before technology came along so why should they make the effort to change their practice? (Ringstaff & Kelley, 2002).

Where there seems to be some promise for technology in the classroom is in the movement toward more personalized project-based learning in K to 12 learning environments. These learning environments typically employ constructivist learning theory, which allows for an epistemological belief system that places the power for learning in the hands of the student and away from a focus on the teacher as keeper of all that is worthy to learn (Greer, 2014). Bring Your Own Device (BYOD) policies coupled with individualized learning plans, create learning environments where students have the opportunity to integrate technology into their learning without it being a policy objective.

Cohen and Sherman (2014) provide us with a different lens on the psychology behind change. They base their study on the principles of self-affirmation theory and the preservation of self, in an attempt to explain the psychology behind change. Perhaps more importantly they go on to suggest how psychological interventions can facilitate lasting and constructive change. Self-affirmation theory tells us that people want to maintain their self-integrity, which is “a sense of global efficacy, an image of oneself as able to control important adaptive and moral outcomes in one’s life” (Cohen & Sherman, p. 336).

Unfortunately, we live in a world where the teaching profession is under constant attack in the media (Westervelt, 2015; White, 2013); therefore, by Choen and Sherman’s own definition, self-integrity is not a strong characteristic in the modern day teaching profession. As a result, the education system is not very fertile ground for change. Even if this change may be positive, itself-integrity is threatened, “people defensively distort, deny, and misrepresent reality

in a manner that protects self-integrity. The cost of doing so ... is that they miss potential opportunities for learning and growth that ... could otherwise increase their adaptiveness in the long term” (Cohen & Sherman, 2006, p. 232).

If Cohen and Sherman’s research on self-affirmation theory were to be adopted into technology implementation plans at the classroom and school district levels, whereby the plan is a collaborative effort designed to meet the needs and address the concerns of the entire school community, it would go a long way to foster a far greater level of trust and acceptance from teachers in the classroom.

*The self is both a barrier and a catalyst to social change. People want to learn, grow, be healthy, and have rewarding relationships, but psychological threat can impede their ability to do so. By helping people to situate threats into a narrative of global adequacy, affirmations turn down the inner alarm of psychological threat. They thus lessen stress and self-protective defenses. Less encumbered, people can make better use of the resources for performance and growth in their social environment, in their relationships, and in themselves. (Cohen & Sherman, 2014, p. 354)*

Considering Cohen and Sherman’s work on the importance of the individual in change, it makes sense as to why the adoption of technology into education has been such a struggle, yet there are pockets of technology adoption by educators. It is likely that these pockets occur where an administrator, who understands the subtleties of self-integrity and ensures there is a culture of collaboration and support established in their schools as part of their technology implementation plan (Wang, 2013).

## **Government Policies Behind Technology in Education.**

While Canadian education ministries support the integration of technology into the classroom, in practice their actions are not progressive when compared to policies and support for technology integration in education globally. In this section, I will review two international cases and how they approach technology integration in K12 schools.

**A Korean example.** Korea has taken on the challenge of integrating technology into education with vigorous planning, action and money. Directed through national planning and policies, the contrast between Canadian jurisdictions and Korean is still stark. In 2010, Korea took on a five-year plan to revolutionize digital education (Grzybowski, 2013). Although technology was not the focus, it was an integral part of what they refer to as the SMART plan: “The main goal of implementing the SMART program was to digitize the entire school curriculum by 2015 and reflect modern changes of the 21st century” (Grzybowski, p. 4).

This lofty, but achievable goal, came with a major commitment from government in the form of investments in infrastructure, digital tools, and training. The planned financial commitment over this five-year period was 1.8 billion United States dollars (Grzybowski, 2013). What is important to note here is that this “SMART Plan” is only a part of a larger master plan that began in 1996. The Korean government recognized early on that in order to make these revolutionary changes in technology and education, a significant investment in the way of planning, organization, and support needed to be put in place. In Korea’s case, the government took on the challenge to make ICT a centerpiece of their education system. Starting in 1996, they implemented an 18-year, four-phase plan, which culminated in 2014. In this plan, they ensured that the country's infrastructure was adequate, digital curricular content was available, and professional development was provided to teachers and administration (Lim, 2013, p. 23). The

foresight and planning involved in how Korea has approached ICT in education is staggering and without a doubt an example of making a concerted effort to bring about change. Since 1996, their master plan was focused on ensuring that funding was provided, infrastructure was built, curriculum and resources were created, and support and training was provided to educators.

In a 2010, the UNESCO publication, titled “*E-learning in the Republic of Korea*,” attributed Korea’s “ICT readiness” to their master plan and identify that infrastructure and content (curriculum and resources) need to be in place before teacher training and ultimately effective classroom implementation can take place.

*Master plans generally include comprehensive plans such as content development and ICT infrastructure; therefore, the topics of teacher training programmes are in line with these priorities and support national initiatives. This approach contributes to the effectiveness of teacher training. (Hwang, Yang, & Kim, 2010, p. 81)*

In addition, UNESCO further identifies the reason other jurisdictions have trouble becoming ICT ready, which is that their plans do not always ensure that infrastructure and content are in place, therefore making teacher training fruitless endeavours:

*The cases of several countries demonstrate the gap between teacher training topics and national status of ICT readiness. Thus, teachers are frustrated if they cannot apply the knowledge they acquired during the training to their classroom activities due to lack of infrastructure and content. (UNESCO, 2010, p. 81)*

The lengths to which the Koreans have gone to, in the informatization of their education system, is impressive to say the least. It would be refreshing to see the same effort made by Canada’s education ministries in the near future.

**The Finnish way.** When discussing educational reform, Finland, which ranks as one of the world's top education systems, is often cited by both researchers and educational administrators as the education system to measure up to (Sahlberg, 2011). What makes them a world leader is their constant pursuit of well-planned education reform (Jouni Kangasniemi, 2015). With their most recent 2014 release of *A New Finnish National Core Curriculum for Basic Education*, Finland has once again shown their willingness to actively engage in education reform.

Like Korea, Finland is approaching the integration of technology into education as a national priority since the 1990's (Niemi, Kynäslähti, & Vahtivuori-Hänninen, 2013). Today, Finland's ICT integration efforts fall under the *National Educational Technology Plan* to ensure that all jurisdiction within Finland have equal access and support for their technological implementation goals (Niemi, Toom, Kallioniemi, 2012). In Finland's case, it is the National Agency for Technology and Innovation (TEKES), a branch of the Ministry of Employment and the Economy that supports the development of educational technology in Finnish Schools. In Finland, all stakeholders, including teachers, students, parents, researchers, policy makers, and companies work together toward "joint aims" (Niemi, Multisilta, Lipponen, & Vivitsou, 2014), which results in "meaning-making and acting in parallel directions in many areas and on many levels of the system" (Niemi, Kynäslähti, & Vahtivuori-Hänninen, 2013, p. 68). This practice consists of "large multidisciplinary research and development networks in which researchers, practitioners, and both the private and public sectors have worked together" (Niemi et al., 2014, p. 12). It would appear that Finland, like Korea, understand that in order for technology in education to be effective and meaningful, it needs more attention than political promises and rhetoric. It requires action that is both planned and funded appropriately and ultimately

implemented (Cuban, 2013). Like Korea, the Finnish government has strong, well-organized, and committed governmental structures in place to bring about change in the education system but where they differ is that Finland looks to inspire innovation in teaching through ICT by connecting the public education system with the private sector to bring about this change.

*This program aims to connect technology companies with teachers and other pedagogical experts in order to promote new solutions in learning spaces that are in many ways boundless. New learning spaces are bringing new elements to the system. The aim is to create a value-network between teachers, researchers, and the public and private sectors. (Niemi et al., 2014, p. 16)*

Without question, Finland is far more forward thinking when it comes to their education system. Jouni Kangasniemi (2015), senior adviser for policies at the Ministry of Education and Culture, said during a panel discussion at the *Google Education on Air Conference* in May 2015 that “It takes approximately 10 years to implement your new ideas and make a big broad systemic change” (20:40) and, furthermore, these planned educational changes must not be undone by changes in government. The Finnish government understands that stability in the system is key and they “keep the system stable enough so that it is not changing when new office comes into power... They build on what has previously been built and they see the importance of carrying all the decisions that they make, they should be so that they last” (Kangasniemi, 21:00).

**The Canadian experience.** In comparing Canada to the aforementioned countries, ICT in education appears to be more fragmented in implementation design. In large part, this is because of the way education responsibilities are divided up in Canada. Each province is

responsible for their own education system and so there is no real cohesive vision for ICT in Education throughout the country.

During the 2003/04 school year, Statistics Canada (2005) did a survey of 15,541 schools to get a better idea of how ICT's were being used in Canadian schools. Its purpose was to "guide future policy and program development and provide the basis for future research related to the use of ICT in learning" (Statistics Canada, p. 4), but these policies and programs would not be coming from the federal government but instead it would be up to the provinces to create the policy and plans. One of the anecdotal pieces of feedback reported out from this survey in Statistics Canada Daily news release, painted a clear picture of the state ICT's in Canadian Schools.

According to school principals, most teachers possessed the required technical skills to use ICT for preparing report cards, taking attendance or recording grades. However, slightly less than half of school principals felt that the majority of their teachers were adequately prepared to engage their students effectively in the use of ICT to enhance their learning. Statistics Canada. (Statistics Canada, 2004)

As helpful as the Statistics Canada survey may have been, many provinces still have no current policy document/framework on how to go about implementing technology into Public Education (see Table 3).

Table 3

*State of Provincial ICT for Education Policy*

<b>Province</b>	<b>Education Policy Framework For ICT</b>	<b>Direct inquiry to Ministry</b>
British Columbia	2010 & 2013	Working on new
Alberta	2013	No update
Saskatchewan	2013	Implementing 2013 policy
Manitoba	2006	No update
Ontario	None	Working on new policy
New Brunswick	2001	No update
Nova Scotia	2001	No update
PEI	2001	No response
Newfoundland	2001	No update
Yukon	2014	No Update
Nunavut	None	No response
NWT	None	No response
Quebec	2001	Working on new policy

As Table 3 illustrates, most Canadian provinces do not seem to be making technology implementation a priority and, if implementation plans are in the works, detailed information is not readily available to the public. In contrast, the Korean and Finnish governments have made their plans clearly known to all stakeholders and have been doing so for years as part of their planning process. The current documents that are available from British Columbia, Alberta,

Saskatchewan, Ontario, Yukon, and Northwest Territories are filled with good intentions but lack what Fullan (2013) would refer to as change knowledge. For the most part, the “how” to bring about change, is missing from these documents

## **Curriculum**

At present, most of the ICT curriculum in Canada is dated and in dire need of some updating (see Table 1). Most of this curriculum deals with the use of technology as a utilitarian skill disconnected from a personalized and integrated inquiry-based learning context. For example, the following are curricular objectives from British Columbia ICT curriculum:

- Use a variety of information technology tools to access information
- Apply information technology to all walks of life, including education and recreation, and to future careers
- Identify and describe various information technology tools related to careers
- Demonstrate an understanding of safe ergonomic strategies for the use of information technology
- Apply information technology tools in research

(British Columbia Ministry of Education, 1996, p. 4)

Granted these utilitarian skills are still needed when using technology, but there is a need for the curriculum to evolve to include those 21st-century thinking skills discussed earlier, along with something called computational thinking. We have moved past the simple use of machines to assist us in our day-to-day work and into a world where technology has changed the way we think and problem solve. In the absence of curriculum and resources to assist teachers in

implementing what could be considered the ‘New ICT,’ they are left to develop their own curriculum to meet the modern day technology needs of their students (Sinko & Lehtinen, 1999).

In a 2011 project sponsored by the National Science Foundation called, *Bringing Computational Thinking to K-12*, there is a call for a concerted effort to introduce computational thinking into the curriculum at all levels. The rationale being, is that although the impact of computing in all areas of work and life has rapidly expanded over the past decade that impact is not reflected in our curriculum. The reality is that our children will need to have these skills as they move into the 21<sup>st</sup> Century educational institutions and workplaces:

*All of today’s students will go on to live a life heavily influenced by computing, and many will work in fields that involve or are influenced by computing. They must begin to work with algorithmic problem solving and computational methods and tools in K-12.* (Barr & Stephenson, 2011, p. 49)

They further say that “educational policy must be changed, overcoming significant infrastructure hurdles, and K-12 teachers need resources, starting with a cogent definition and relevant age appropriate examples” (Barr & Stephenson, 2011, p. 49). It is clear from this project that Barr and Stevenson feel that there needs to be a coordinated nationwide effort to create a curriculum that can be used by all teachers at all levels and in all subjects. As it stands now, many schools follow a Islands of Innovation strategy. This is where technology is implemented and curriculum developed by a small number of teachers within the school. It is hoped that the innovation which occurs in those limited number of classrooms, will ultimately spread to the rest of the school. Unfortunately, this is not what occurs. (Avidov-Ungar, O., & Eshet-Alkakay, Y., 2011).

If it is decided that it was better to go the route of having teachers develop their own curriculum, Boschman, McKenney, and Voogt (2014) point out that, when it comes to curricular

design, teachers are very pragmatic. Practical concerns such as a teachers' existing knowledge and ability, along with various pedagogical considerations, play a significant role in any curriculum development endeavour. It is suggested that if it is expected that teachers will develop their own curriculum, having exemplar curricular materials to base their own designs and adaptations would be helpful and significantly improve the chances of success.

Teachers developing their own ICT curriculum is by no means a recent phenomenon. In a 1999 evaluation project of ICT in Finnish schools conducted by The Finnish National Fund for Research and Development, the authors (Sinko & Lehtinen) identified that at all levels of education from K through post-secondary that “curricular shortcomings make it difficult to use ICT effectively” (p. 237). They also go on to point out that:

*...the use of IT has not been generated by the curriculum but instead by the teachers' personal approach. This was satisfactory during the pioneer phase, but the long-term consolidation of ICT use and the students' needs for it requires greater curricular commitment in this respect. (Sinko & Lehtinen, p. 237)*

In 2006, Finland introduced new subject-wide curricular changes that addressed the challenges pointed out in the Sinko and Lehtinen report. In 2016, Finland will be introducing subject-wide curriculum changes once again and ICT will be part of that update. In contrast, it would seem most Canadian jurisdictions are still operating in the “pioneer phase” when it comes to ICT in education (see Table 1).

### **Professional Development**

It cannot possibly be stressed enough that teachers need quality professional development opportunities to ensure their teaching practice and subject knowledge meets the needs of their students and improve learning outcomes (Mizell, 2010). As such, regular professional

development sessions during the school year are commonplace in most public school jurisdictions throughout North America (Mizell, 2010). Unfortunately, when it comes to ICT in education, there does not seem to be adequate professional development opportunities (El Semary, 2011). There seems to be an assumption that teachers will somehow independently acquire the skills they need (Cuban, Kirkpatrick, & Peck, 2001; Reid, 2014). Some teachers can manage to self-teach the skills they need while others would like to implement more technology into their teaching but simply do not have the ability:

*According to a recent survey by two largest teachers' unions, most educators are enthusiastic about the role technology can play in improving learning, but many still feel unprepared to take advantage of digital tools in the classroom. (El Semary, 2011, p. 23)*

Perhaps even more significant is the lack of recognition that the adoption of ICT's into the classroom is not simply a matter of learning the skills, it also involves changing long-held epistemological beliefs in how teaching and learning occurs (Roland, Colella, & Igbokwe, 2014). It needs to be recognized that professional development is more than learning skills; it is also about redefining what is considered best practice through sharing knowledge and experiences. (Roland, Colella, & Igbokwe). The idea of shared knowledge in a collaborative environment is seen as crucial to any successful technology implementation plan (El Semary, 2011; Trajkovik & Mishev, 2014; UNESCO, 2011), but El Semary (2011) broadens the definition of what good ICT professional development means even further by suggesting that both teachers and students need training alongside each other. The need to develop the skills and understanding of students may seem to be a bit redundant, but when considering the myth of the "Digital Native," the idea of whole school professional development involving ICT, becomes even more relevant. Many students are not coming to class with the technological skills and abilities required for academic

work and need as much training as instructors (Margaryan, Littlejohn & Vojt, 2011; Selwyn, 2009) and a professional development model that included both students and teachers would go a long way in creating a culture of digital learning.

As convenient as it may be to hope teachers will acquire the skills necessary to create a 21st century classroom, on top of their existing curricular obligations, are unlikely to occur without appropriate professional development.

*21st century knowledge and skills include creativity, innovation, critical thinking, problem-solving, communication, collaboration, personal responsibility, global awareness, social/intercultural skills, team learning, and of course, mastery of rigorous academic content. However, the integration of these skills into instruction of already-packed core subject areas often presents a challenge to many teachers. This challenge is likely to persist until teachers receive adequate training and are provided with good examples on how to integrate these skills into the K–12 curriculum. (Duran, Yaussey & Yaussey, 2011, p. 99)*

The demands of today's classroom are many, and it is only through rigorous professional development opportunities that these demands can be met.

## **Conclusion**

Change is inevitable. This truth is set in stone, but how change affects us is not an inevitability. Managing and planning for change is our best defence against unwanted or unintended outcomes when it comes time to implement change. As change pertains to education and, specifically, the implementation of technology in the classroom, there must be a comprehensive action plan in place to ensure that learning communities have the opportunity to embrace technological change, rather than having reason to organize against it. Educational leaders and managers need to understand that for all technology can do for us, it still cannot make itself relevant or useful to a teacher or their students without a clear and careful consideration given to how it can best be utilized. Then, and only then, can an implementation plan be created that will meet the needs for the entire school community.

## Chapter Three: Implementation Questions

The integration of technology into an educational setting is nothing new. New technologies come in and out of the classroom all the time and have done so for generations. Simple things such as ballpoint pens, whiteboards, photocopiers and overhead projectors, were all new technologies at one point. A retired colleague of mine use to say *“The greatest piece of technology that ever entered the classroom during my career, was the overhead projector. It was easy to turn on and I could fix it myself when the light burnt out.”* Unfortunately, the days of technological simplicity have given way to digital technologies that are far more complex than the storied overhead projector. These technologies include, desktop computers, laptops, tablets and smartphones, along with all the peripheral devices that can connect with these devices. Controlling how all these devices operate within the learning environment is a computer network that manages all users and information to and from these devices.

Not only are today’s digital technologies more complex in their design, they also have the potential to disrupt education in a way that technologies of days past could not.

*“The number one benefit of information technology is that it empowers people to do what they want to do. It lets people be creative. It lets people be productive. It lets people learn things they didn't think they could learn before, and so in a sense it is all about potential.” - Steve Ballmer*

As transformative as the overhead projector was, it was more of a utilitarian technology. It could illuminate information, but it could not illuminate a student's potential the way that modern digital technologies can.

Unfortunately, with the transformative potential new technology holds, comes significant challenges for implementation. The introduction of new technologies into the classroom represents a significant change in how teaching and learning takes place; a change which is far more involved than just making a shiny new overhead projector available to any teacher who wanted one. A concerted effort must be made to put the technology into the hands of teachers and then get them to use it.

### **We Need a Technology Implementation Plan**

In Fullan's Change Knowledge theory (2007), he speaks about how change knowledge is an important step in bringing about the action needed to create positive change in a school system. Creating a Technology Implementation Plan (TIP) is an important first step in bringing about positive school change. Without the knowledge that the TIP provides, it is significantly more difficult to act on the technological implementation you would like to see. It is with this in mind, that I have developed a guide to support teachers, schools and districts in their implementation of new technology, using a series of questions for your implementation team to reflect upon – The Four Pillars of Technology Integration: Leadership, Teachers, Curriculum & resources and Professional Development. These pillars represent the essential change knowledge needed to successfully implement technology into the classroom.

This project is divided into two sections. First we will look at the significance of each pillar, followed by a set of guiding questions, which should be asked by an implementation team about their TIP. It is the process of going through these questions that generates the change knowledge needed to effectively implement technology into the classroom.

## The Four Pillars of Integration

**Leadership.** Leadership is essential in the planning process when it comes to technology. This leadership needs to come from government, senior school district administration, school administration, and from teachers. It is only by working together at all levels that a TIP can be successful.

When major technology implementation projects are being planned, the role of government and senior administration within a school district will generally revolve around infrastructure and funding of the project. They lay the groundwork on which a TIP can be implemented. The leadership role that government takes however is of utmost importance. As tiresome as using Korea and Finland as exemplars may be, they have established that strong consistent leadership at the ministerial level, ensures the long term viability of a TIP. Active ministerial oversight also helps ensure that implementation is equitable and consistently applied throughout the country. In Finland, this falls under the *National Educational Technology Plan* and in Korea was the *Master Plan*. Although in Canada, education responsibilities are provincial and not national, technology implementation initiatives would be greatly improved if provincial education ministries were more involved in the implementation process. In a 2011 UNESCO report, the importance of government involvement was cited as being central to the success of any TIP for Education:

*The continual success in the use of ICT for teaching and learning will necessarily depend on a committed government that has the tenacity to see through the implementation of various ICT Master Plans in Education as well as the foresight to chart out future needs in this area. (p. 65)*

Once the upper levels of leadership have created an environment where implementation can take place, school level leadership can begin to take on the task of executing the integration plan for their school. At this level, strong leadership needs to come from both administration and teachers. At this point the plan meets the classroom and ultimately transforms the learning environment. It is crucial to have teacher leaders at the forefront of classroom implementation, as they are the ones who best understand the needs and concerns of the teachers in the classroom.

**Teachers.** Teachers are the single most important group in your implementation plan. If they are not on board with what is being planned, it is not likely to succeed. As nice as it would be able to simply decree that all teachers will implement technology in the classroom, it is not quite that easy. There are a number of considerations that need to be made, the least of which is supplying them with the tools to do the job.

What is important to understand is that for many teachers, the implementation of technology for teaching and learning constitutes a major change in what they have come to know as sound pedagogical practice. For these teachers the push to increase the use of technology represents a challenge to their epistemological beliefs (Greer, 2014). As a result, teachers can feel as though their professional autonomy and integrity are being compromised. If this kind of challenge is perceived, there is the genuine risk that rather than being agents of change, teachers will actively resist the implementation of technology in their classrooms (Cohen & Sherman, 2006). The psychology of change and or change theory tells us that teachers need to feel as though their work is important and their opinion matters. The psychology may be complex, but the solution to ensuring your teachers are on board with the TIP is simple. Teachers must be involved in the planning of the TIP through a collaborative process which engages and reinforces importance of the role of teacher within technology rich learning environment. The process by

which teachers are given a voice in the planning process is largely dependent on school-level administration. It is within the school setting where constructive dialog amongst staff is fostered and a collaborative work environment is encouraged. It is by giving teachers support, respect, and input that you will get teachers to be active participants in the creation and implementation of your TIP (Wang, 2013)

**Curriculum and resources.** We know that curriculum guides instruction and recommends resources for any given subject area. Unfortunately, there are very few Canadian jurisdictions that have developed new curriculum or resources with which teachers can implement new learning technologies. In contacting Canadian jurisdictions, most have at least identified the need for new curriculum, but few have gotten beyond the planning stages of what that curriculum will look like.

The problem with an absence of curriculum and resources, is that teachers are forced to develop these resources and adapt curriculum for themselves. Although this is not an uncommon practice amongst teachers, it can be difficult to do for those who do not familiar with using technology for teaching and learning. This group of teachers may initially make the attempt to use technology, but with nothing to direct or support its use in their classroom, they will quickly abandon its use and leave technology unused. Those teachers who do have the skill and knowledge to create their own curriculum, usually do so in isolation and their work rarely reaches the broader teaching community. These teachers work in what is referred to as Islands of Innovation, where wonderful things are occurring, but rarely does their work go beyond their classrooms (Avidov-Ungar & Eshet-Alkabay, 2011). Finland referred to this type of isolated work as the “pioneering phase” of tech integration, and in 2006 moved to ensure all teachers had

access to quality curriculum for using technology. In 2016, Finland will be implementing a new curriculum that addresses the curricular inadequacies they found.

If curriculum and resources are not provided as part of the TIP, it must then provide teachers with the time and opportunity to build curriculum collaboratively and create the resources that meet the needs of the teachers who are expected to use the technology.

**Professional development.** Professional development (Pro-D) is an important part of keeping teachers current in their teaching practice and content knowledge. Pro-D is where teachers are introduced to new curriculum and instructional methods. It is where teachers are able to explore, collaborate and learn how best to create positive learning experiences for their students. Logically then, professional development would be the vehicle by which, teachers learn how to best use technology to deliver, adapt and enhance the curriculum for their students. If there is no provision for Pro-D in your TIP, it will be difficult for your implementation plan to succeed (El Semary, 2011; Trajkovik & Mishev, 2014; UNESCO, 2011).

The introduction of any new pedagogy, resource or curriculum, requires teachers to adopt new skills and knowledge. It takes time and practice for this knowledge and new skills to become part of a teacher's practice. To make this happen, teachers must be given quality Pro-D opportunities that are more than a couple of show-and-tell sessions and then hope everyone jumps on board. Unless teachers can see some relevance of the new learning tool, it can be seen as an imposition; an inconvenient add-on to existing professional development obligations within their subject area.

*Integration of these skills into instruction of already-packed core subject areas often presents a challenge to many teachers. This challenge is likely to persist until teachers*

*receive adequate training and are provided with good examples on how to integrate these skills into the K–12 curriculum.* (Duran, Yaussey & Yaussey, 2011, p. 99)

In order for teachers to accept that professional development is important and worth their time, they must be able to see the value in it for both themselves and their students. The irony is that surveys have found “most educators are enthusiastic about the role technology can play in improving learning, but many still feel unprepared to take advantage of digital tools in the classroom” (El Semary, 2011, p. 23). This would suggest that there is immense opportunity for change in education through the use of technology, but greater effort must be put into Pro-D in order to capitalize on that opportunity.

The question of how to capitalize on a willingness to change, grow and evolve through technology can only be answered by asking a number of other questions around the mechanics of a good TIP. It is only through answering these questions, that you build an action plan that answers that global question of how do we do it?

### **Guiding Questions for Implementation**

To support the development of your TIP, I recommend that your implementation team attend to reflecting upon and answering the questions associated with the four pillars of integration: leadership, teachers, curriculum & resources, and professional development. Although not exhaustive, what follows is a series of questions that should be asked as the TIP is developed. Following each question, is some supporting thoughts to help guide your implementation team. The supporting thoughts are derived from a combination of the research done for this project and personal experience working with technology in education for the past 20 years.

What you should find is that as you answer these questions, your Implementation Plan will begin to come together. As every organization is unique, you may come up with questions that are not posed within this project, but as you answer the questions below, any new questions you may come up with, should be easier to answer.

### **Pillar 1: Implementation Questions - Leadership**

**What are you trying to accomplish?** You would think figuring out what you are trying to accomplish would be pretty easy, but when you start to dissect it, you may find that your answer is far more complex than expected. The obvious of course is that you want to improve learning, teaching and give students some solid technology skills that they can take with them as they move on in their academic careers and into the work world. However, the importance of technology in our lives has become far more significant however, than just acquiring some typing skills and making some flashy power points and this significance needs to be reflected in the way we use technology in our classrooms. What needs to become an integral part of our education system and the core of what your TIP is trying to accomplish, is using technology to expand on new digitally based learning opportunities and create an engaged 21st century citizenry.

*Expanded learning opportunities.* Technology has created new learning opportunities, because of its ability to deliver information anywhere anytime. For better or worse, it has created a type of learning that has been referred to as Free Agent Learning. With technology, learning is no longer anchored to the information that is available in the classroom setting (Nagel, D. 2009). To some educators, the notion of a Free Agent Learner can be threatening, but unfettered access to free agent learning opportunities is a reality that we all must adapt to. As important as the traditional role of teacher has been and will continue to be, the role of the teacher in the 21st

century has expanded to include acting as a guide to kids who are seeking out their own learning opportunities.

***Engaged 21st century citizenship.*** The way we engage with the information available to us has changed so significantly, so quickly in the past 20 years that it can seem like we are lost in a flood of information. In comparison, our sources of information in the past were relatively static and predictable (if somewhat incomplete). Information was delivered to us in the pages of a book or newspaper or through the airwaves at regularly scheduled intervals, it was manageable and made sense to us. Today, however, information is ever changing and knows no schedule, yet our students still need to make sense of it in order to be an engaged 21st century citizen. This is why it is so important that our education system begin to accept and teach students how to interact with 21st century information flows.

**Where is the money going to come from?** While some jurisdictions fully fund a TIP, many do not, and this can create a major hurdle to overcome in planning for a major technology implementation. There are a number of funding possibilities available to school districts.

***Additional ministry funding.*** In a perfect world, the education ministry would pay for all your implementation needs, but resources are limited. Most ministry money will not come in the form of direct allocation but in the form of grants for which your school or district will need to apply. The problem with grants, is that the application process takes time and the resources is transient.

***From existing technology budget.*** Depending on how you decide to allocate technology to staff and students, it might not be necessary to maintain as many computer labs or laptop carts. Downsizing the number of school-bound devices that are purchased and maintain, may provide access to additional resources to support your TIP. Before you go this route, however,

you would need to take a careful look at how many school-bound devices are required for specialty courses such as ICT, Drafting, Video Production, etc.

***Private partnerships.*** One popular option for government is public/private partnerships. In Canada, this option is controversial because public funding is one of the fundamental tenets of public education. Unfortunately, fiscal realities and political platforms have resulted in the government not covering all costs and private contributions have become a significant source of funding. In Finland, partnerships with the private sector are at the core of technology implementation in education, but public funding is still considered a fundamental part of the education system (Niemi, Multisilta, Lipponen & Vivitsou, 2014).

**Will your funding source be able to sustain what you want to create?** Regular year-to-year funding is paramount to ensure the long term stability of your TIP. Once again, if we look to Korea and Finland as exemplars, both fully fund their TIP's. This means that teacher training, resources & curriculum development and hardware acquisition are paid for. In the last five years of Korea's *Master Plan*, they spent 1.8 billion dollars alone on hardware, training and curriculum. Granted, these are nations that have mobilized to bring technology into the classroom, but it does not matter at what level the TIP is funded. The implementation of technology requires money and the amount you have available, will determine the scope and duration of your plan.

**Do you have the infrastructure?** The capacity of your network is crucial to the success of your implementation plan. It must be able to handle the demand or it will simply lead to

frustration for both students and staff. If your staff and students are frustrated with the technology, it is unlikely they will continue to use it for teaching and learning.

**Do you have the staff to manage the network?** In addition to the capacity of the physical network, you need to ensure you have the network administrative staff to handle ongoing maintenance and ensure a trouble free experience for users.

**Do your students have home access to Internet?** Students may have access to the Internet at school, but might not have access at home. How do you plan to handle issues around equity of access? If students are expected to access homework and other resources from home, your TIP will need to consider the possibility that not all children will have the same level of access from home.

**What is your timeline?** If your plan does not have a timeline, it will be difficult to measure your progress and direct your efforts as your TIP unfolds. The first two points to identify on this timeline, is where you are starting from and where you want to be. With these two points plotted, you then need to determine how much time you are willing to apply to this transition. A single year for a large scale implementation of technology will not be enough time. Two years should be the absolute minimum for implementing any TIP. You should set achievable goals for each year and the total timeline should be a minimum of three years. As you evaluate your TIP at the end of each year, you can add time if needed.

**What is your starting point?** The process of determining where you are starting from is a helpful exercise. It is a good time to take stock of what is already happening with technology in

your schools and it helps identify the teachers who can be utilized as leaders in the development and execution of your TIP.

Determining how well your school(s) are using technology already, is not all that difficult. Having staff complete a simple survey might be all you need to get an idea of what is happening in the classroom. If you want a little more detail, you could use the SAMR model to evaluate how effectively your school(s) are utilizing technology. First introduced by Dr. Ruben Puentedura, the SAMR model divides the use of technology for teaching into 4 distinct levels.

- Substitution: Tech acts as a direct tool substitute, with no functional change
- Augmentation: Tech acts as a direct tool substitute, with functional improvement
- Modification: Tech allows for significant task redesign
- Redefinition: Tech allows for the creation of new tasks, previously inconceivable (Puentedura, 2010)

These levels represent the degree by which technology impacts teaching and learning.

Substitution being the lowest level and redefinition the highest. After a brief overview of the SAMR model, most teachers will be able to self-report at what level they operate at. Once you have this information you can begin to make plans going forward.

***What is your endpoint?*** It is important to distinguish between this question and the aforementioned question of *what are you trying to accomplish?* This question pertains to what it is you expect to see in the classroom with regards to the use of technology. Your end point should be a clear collection of observable activities and skills demonstrated by both teachers and students. The following figure provides some basic endpoint markers you may want to consider for your TIP.

<p>Students should have</p> <ul style="list-style-type: none"> <li>• A device to work on when required</li> <li>• Dependable network and Internet access.</li> <li>• Opportunities to demonstrate learning using technology</li> <li>• Timely technical support</li> </ul>	<p>Teachers should have</p> <ul style="list-style-type: none"> <li>• A device to teach with</li> <li>• Dependable network and Internet access</li> <li>• Curriculum and resources</li> <li>• Timely technical and teaching support</li> <li>• Professional development opportunities</li> </ul>
<p>Students can</p> <ul style="list-style-type: none"> <li>• Create a positive digital presence</li> <li>• Effectively create, communicate and collaborate using technology</li> <li>• Identify fact-based, bias-free information for academic purposes</li> <li>• Share ideas and opinions online in a constructive, non-offensive manner</li> <li>• Find relevant and accurate information online for staying informed about one's community and the world</li> </ul>	<p>Teachers can</p> <ul style="list-style-type: none"> <li>• Utilize technology to enhance direct instruction</li> <li>• Create assignments and resources that make effective use of technology</li> <li>• Evaluate student assignments and provide feedback using technology</li> <li>• Find fact-based, bias-free information online to support instruction</li> <li>• Challenge students to make effective use of technology to pursue their own inquiry questions</li> <li>• Utilize social media to engage with educators within and beyond their school</li> </ul>

Figure 1. Basic endpoint markers to be considered as part of a TIP

It is important to recognize that as technology changes, so may your expectations. For example:

*Utilize social media to engage with educators within and beyond their school*, would not have been considered a technology skill 10 years ago. It has only been in the past five years that teachers have utilize twitter as a means of connecting with other teaching professionals.

***At what grade will you start?*** A school-wide technology roll-out for all grades can be big undertaking. The demands on the network and your implementation team can be overwhelming if you try implement everything in one year. It would be advisable to implement one grade at a time to start. For example, in a Grade 8 to 12 school, start with the grade eights and then

continue expanding the implementation as they progress through the grades. If your implementation is going smoothly in the first two years, you can decide if adding the rest of the grades in year three is warranted. At most your implementation will take five years. By approaching your implementation this way, it is much easier to work through network issues, provide teachers with professional development and curricular support and support students in the use of technology for learning.

**How will you allocate hardware?** For a TIP to work, students must have regular access to the technology that will allow them to participate in a technology rich learning environment. The traditional model where schools provide access to technology in designated computer labs or with laptop carts, simply doesn't provide for enough regular access the hardware needed to effectively support a technology enriched learning environment. To accomplish this, schools will have to figure out how to make technology accessible to students at any time. The following are a number of options available.

***Bring Your Own Device (BYOD).*** BYOD has become a popular choice in school districts where families can afford to purchase a device for their child. Parents and students choose a device that will fit their learning needs.

***School-supported BYOD.*** School-supported BYOD is a model where the school provides a portion of the cost for student to buy their own device. This lowers the cost of purchasing a device for families, and when combined with a school loaner program, ensures that all students have an appropriate device that meets their educational needs.

***School-supplied hardware.*** With this model, the school provides and maintains school-based devices in the form of computer labs, classroom-based computers, and laptop carts. This is the model that most schools would like to move away from because of the cost associated with

acquisition and maintenance. Although there is still a need for this kind of hardware allocation, many school districts are moving away from this model.

*What is an acceptable device?* Device choice is important, in that it needs to be powerful enough for students to be able to work efficiently and still be affordable enough to not be a financial burden. There are a number of budget-conscious devices in the market that are more than adequate for most school applications. Cell phones should not be considered to be a primary device, simply because they do not provide the functionality necessary to fully participate in a media-rich, academic environment. A good rule of thumb is, if it does not have a physical keyboard, it should not be considered an acceptable device.

*How will the school help families who cannot afford to purchase a device?* Most schools have established a process by which they are able to help out families that need financial assistance. Affordability can become a significant issue around equity of access when it comes to technology and must be a part of your TIP. It may be necessary to create a school loaner program to ensure that students who cannot afford a device, can have one to use during the school year. Once the school year is over or the student leaves the school, the device is returned.

## **Pillar 2: Implementation Questions – Teachers**

**How will teachers participate in the discussion?** Giving teachers a say in technology implementation is crucial to ensuring the success of your TIP. Giving teachers input into integration plans gives them the opportunity to address their pedagogical and professional concerns. It also gives teachers the opportunity to share their ideas and vision on how best to implement technology for teaching and learning. Finally, it will give administration the

opportunity to identify teachers who are interested in taking on a leadership role in the executing the TIP.

*Through their union.* Although this choice may be seen as a way of protecting the interests of teachers, it does not always foster the best working relationship between teachers and administration. If teachers are encouraged to look at the creation of the TIP as more of a negotiation around the conditions of employment, the focus on improving teaching and learning may be lost.

*Through survey or needs inventory.* This is a great place to start, but teacher input cannot be limited to just the completion of a needs inventory. The needs inventory should be used to help establish where teachers are currently at, then you can determine what support is needed to help teachers improve and expand on what they are already doing.

*Through representatives at school-based and district planning committees.* Committees are perhaps the most efficient way of sharing the needs and ideas of the greater teaching community, especially in large school districts, but it can exclude teachers who do not have a leadership role in their school. Young teachers or teachers who are new to a school district or school might not have an established voice within the school community, so care must be taken to encourage feedback from all teachers.

*Invite all teachers to attend broad-based planning forums.* This is a good way to give teaching staff input with respect to the TIP, but it can be unwieldy when the number of participants is too large. This option is best offered at the school level first, and then if needed, expanded to the district level.

**How do we encourage innovation?** If you want teachers to do innovative things with technology, you need to let them do innovative things with technology. Teachers who take risks

and do pioneering things with technology in their classrooms, report that they have done so because they felt their administrators supported what they were doing (e.g., Pro-D, resources, acknowledgement, etc.). Although your TIP needs to be clearly defined in its execution, it must give teachers the freedom to take the additional risks needed to be innovative (Risquez & Moore, 2013).

**What are the expectations for teachers in their use of technology?** This question is not openly discussed very often. There is a nervous energy around it, fueled by passionate beliefs about teaching that do not include the use of technology. As uncomfortable as the discussion may be however, it needs to occur. Recognizing that a good TIP should not be about the total disruption of traditional teaching, the discussion should be around the addition of new ways of exploring and augmenting the curriculum using technology. No teacher should walk away from one of these discussions feeling that everything they have ever known or done as a teacher is now obsolete or ineffective. Instead, if your TIP is set up properly, teachers should feel as though they have the support and resources to take on the challenge of adopting new tools at a pace they are comfortable with.

If devices are available to students, achieving the first level of the SAMR model should not be a problem for most teachers. As a teacher moves from substitution to redefinition, greater expertise and support will be needed. It should be noted that, the modification and redefinition levels of the SAMR model, represent a significant shift in teaching and learning that not every teacher will be comfortable with. This is acceptable, however, as the goal of your TIP should be to create new instructional options, not eliminate the ones teachers currently utilize.

**How will teachers be provided with the technology to teach with?** Teachers are known for spending significant amounts of their own money on classroom resources, but when it

comes to technology, the cost is prohibitive. Expecting teachers to pay for the cost of their teaching technology is simply unacceptable. For a TIP to work, the school district must supply teachers with the technology they are expected to use. The drawback with this option is that it is expensive and the district will still have to maintain those devices. Another less expensive option is school district providing teachers a subsidy to buy a device of their own for use in the classroom. Although some of the cost is downloaded to the teacher, this option allows the teacher the opportunity to buy a device that suits their needs.

### **Pillar 3: Implementation Questions - Curriculum & Resources**

**What should we update first?** When it comes to technology in the classroom, the focus is usually on the hardware. Laptops, tablets, projectors... They are the flashy, humming, beeping things that get people excited about technology in the classroom. Unfortunately, in all this excitement, people tend to forget about curriculum and resources that need to go along with the hardware. When developing your TIP it is important to recognize that device is just the vehicle by which teachers and students move through the digital landscape, but without curriculum and resources to fuel those devices, your TIP will have difficulty moving forward.

As you build your TIP, you will need to assess what you need to provide in the way of curriculum and resources. If you are going to use existing curriculum and just want to change the way teachers deliver it to students, you will simply need to provide the digital content and necessary applications to use with the hardware. If you are looking transform what teaching and learning looks like through the use of technology, then you will need to provide the curriculum and resources to facilitate this transformation.

Most jurisdictions that I have ever encountered, only manage to change how teachers deliver the curriculum through the use of technology. Providing the resources to you teachers is a

logical first step, but if your intent is to transform teaching and learning in your school, you will need to take the next step and begin to provide the curriculum that will help make this happen.

**Where will the curriculum & resources come from?** There are five primary sources of curriculum and resources available to you. Ultimately, the choice comes down to what you are obligated to provide as outlined by the school act, what you want teachers to do and students to learn, and where you can find the curriculum and resources that will meet your needs.

*Ministry.* Curriculum intended for a subject-wide application within a province such as British Columbia, tends to be developed by teams of teachers under the auspices of the Ministry of Education. It is a system that works because it serves to provide province wide consistency in what is being taught. With regard to the use of technology however, many provinces have not updated the curriculum in a way which reflects the advances in technology since the 1990's. This has created a significant gap between our teaching and learning needs, and the curriculum and resources needed to support it. Some provinces are working to create new technology in education curriculum but most school districts have been left to develop it for themselves.

*District.* As new curricular needs arise in a district, it is often helpful to provide teachers with time to locally develop curriculum and resources for the district. In some cases, an individual teacher may develop a curriculum and then be supported in sharing it throughout the district, while in other cases, districts may engage a small group of teachers to collaboratively develop curriculum to meet specific needs. This will accomplish two things. First, it will give teachers some ownership and control over how technology might best be utilized in the classroom, and second, it will ensure that there is some continuity across the district in how

technology is used. This is the route that West Vancouver school district will be taking, in an effort to better support teachers as they integrate technology into their classrooms.

***Non-profit organization.*** Curriculum and resources developed by non-profit organizations can effectively meet a specific need. For example, there is a lot of good free digital citizenship curriculum for K-12 through various organizations such as Common Sense Media, Google, and EverFi, but it is difficult to find a complete course that satisfies the required hours of instructional time. Cobbling together a course using curriculum from non-profit organizations, may not lend itself to the kind of continuity you would want in your curriculum.

***For-profit business.*** Educational publishers often develop curriculum to accompany the resources they produce. This can be a very attractive option as the curriculum and resources are perfectly aligned and you can depend on regular updates. The biggest problems with this option, are that you will be incurring additional costs, your teachers will be tied to using these resources and there is no guarantee that the published product will work with your technology initiative. The Los Angeles Unified School District and their 'iPad's in school' initiative met with disaster when the for-profit vendor could not provide the curriculum and resources needed to make the initiative work (Gilbertson, 2015).

***Provincial resource consortium.*** The Educational Resource Acquisition Consortium, or ERAC, is an organization that seeks out and evaluates resources suitable for the K-12 classroom in British Columbia. Although most of these resources are produced by for-profit publishers, ERAC's evaluation process and volume purchasing power ensures that the resources are available at the best price.

Regardless of where you decide to acquire your curriculum and resources, it is important to approach both your TIP and the curriculum you choose for it, in a thoughtful and measured

manner. If you are developing your own curriculum, keep your timeline in mind and set achievable goals. Start with developing quality units that teachers can use within their existing course syllabus. Over the course of two to five years, your teachers should have a good selection of updated curriculum and resources to use.

If you choose to purchase curriculum and resources (ERAC may have something available), make sure it is compatible with the technology you are using and be aware of any licensing issues that may affect how, where, and when you can use the resources.

#### **Pillar 4: Implementation Questions – Professional Development**

If you want people to use technology in the classroom, you have to provide Pro-D and ongoing in-school professional and technical support. The purpose of these supports are to help ensure that both teachers and students do not experience frustration when trying to use technology in the classroom setting. If teachers do not feel as though they are being supported or if technology does not work as expected, it will quickly be abandoned by both teachers and students and your TIP will be hampered.

**How will professional development be provided?** If you have to bring people in to do the pro-D (do not forget the ongoing support) some teachers may be resistant. Some cost savings and other benefits may be realized if you enlist faculty (individual or team, school or district) to develop and provide pro-D and support in-house. Possible benefits include more immediate access to help, just-in-time training, and faculty buy-in.

***District professional development.*** The usual vehicle for providing teachers with professional development on school district initiatives is through district professional development. It is through locally developed professional development, that a common vision and common set of goals can be created by your learning community. It is here where teachers

can participate in the creation of the TIP, develop curriculum, and acquire the practical skills necessary to implement technology in their classroom.

***In-house teacher support.*** An in-house support person is crucial to the success of your TIP. Their role is to help teachers develop technology-rich lesson plans, model the delivery of such plans, and assist in the classroom when needed. This person can also create professional development opportunities and act as a liaison between the school and senior administrative staff. There should be some non-enrolling time allocated for the position

***Student support team.*** Another option that has been successful in some schools is the creation of a team of students that goes about and assists teachers with the use of technology in the classroom. Although their role is not one of providing professional development for teachers, it does help with troubleshooting, equipment set-up, and other technical issues. Some schools have created an entire tech support course, while others credit these students with service or work experience hours. By engaging students as active participants in the implementation of technology, the entire learning community becomes a part of your TIP.

***Allocate additional professional development time.*** If you are planning on using regularly scheduled professional development times to train teachers, there may be some friction. Many teachers see regularly scheduled professional development time as their opportunity to collaborate with their colleagues in their subject area. Forcing them to use this time to learn about new technologies can be seen as an infringement on their professional autonomy. Some school districts have tackled this issue by providing release time for teachers who have taken a special interest in using technology in their classroom, and hope these teachers will spread the knowledge to the rest of the staff. Although this can be an excellent way to introduce technology to a school, there is a risk of isolating the technology in the hands of the few. “Studies on

technological innovation implementation in education systems show that for the most part, islands of innovation fail to generate overall, comprehensive innovation” (Avidov-Ungar & Eshet-Alkakay, 2011, p. 363). Teachers who have been given release time to learn how to innovate with technology, should be expected to share their learning with the rest of the staff.

**Conclusion.** The implementation of technology into an educational setting is undoubtedly complex and comes with a litany of questions. What do we want to accomplish? Where is the money going to come from? What is our timeline? How do we involve teachers in the planning? Do we have the curriculum and resources? How do we go about providing professional development?... The list of questions can be endless and any organization that is being responsible about how they implement technology, will take the time to ask the most important ones.

The purpose of this project was to impress upon any school district that intends to implement new technology, that they must ask some very important questions before they begin. The questions presented under the four pillars of the TIP are suggestions, and might not be applicable to all schools or districts. Some school districts may already have one or more of the pillars in place, so they can simply focus on the pillars they are not. The benefit of structuring this project as a set of questions is that it allows for the flexibility to use it to create a new TIP, or evaluate an existing one. Once these questions are answered, the resulting TIP will be as unique as the school district or school it has been created for.

## Chapter Four: Reflections

*Judge a man by his questions rather than by his answers – Voltaire*

I stumbled upon this Voltaire quote just as I began to wrap up my work on this Master's project and I felt it summed my work up rather well. If you have arrived at this point in this project, you know that I have no answers, only questions, and according to Voltaire this is a good thing. Perhaps he felt as I do, that there can be no answers without first posing good questions.

This project is rooted in 20 years of frontline experience working with technology in education, needless to say I am a convert. I do not need to be sold on the benefits of technology in education, but the approach I took with this project was not to sell anyone on my opinion. Instead, the purpose of my research and ultimately this project, was to identify what needs to be done to successfully integrate technology into the classrooms of all teachers. Having worked with technology in education for so long, I am well aware of the doubts and questions people have about the benefit of technology in the classroom and it is here that I found my focus for my project. What are the questions that need to be answered in order for technology to be widely accepted in education. As my research progressed and the questions piled up, it became clear that these questions fell under four main categories and these became what I refer to as the four pillars of technology integration. These pillars are leadership, teachers, curriculum and resources, and professional development, and together they create the TIP.

Recognizing that every educational organization is different, I did not simply create a *Step-by-Step Guide to the Perfect Technology Implementation Plan*. Instead, my approach was to identify what I believe to be the crucial questions which must be asked as a school district or school begin to create the TIP. For each question I pose, I provide some thoughts that should be

considered, while going through the process of answering the questions. After all the questions have been answered, what should be left is the foundation of a good TIP.

What I hope is that this project contributes to the elimination of the way technology has been implemented in the past, where technology is sold as answer to all our problems and no one is given the opportunity to question the sales-pitch. By beginning with the questions that make up the pillars of technology implementation, the influence of marketing is mitigated and the technologies that are adopted will have been vetted by a rigorous questioning process.

Only time will tell if any of my work is adopted by anyone. I would venture a guess that not everyone will subscribe to my vision of how the implementation technology in education is done properly. What I am advocating for is a departure from linear top-down decision-making structures by which most educational policy decisions are made. I am also asking teachers to actively participate in the adoption of something that goes against the pedagogical beliefs of many. Finally, I am asking people to invest an extraordinary amount of time and effort to ensure that technology is implemented correctly in our schools. In the end, one thing is certain: technology will eventually change education one way or the other. The question now is, will we make the effort to ensure technology changes education for the better?

### **The Master's Effect**

In keeping with the technology theme of my Master's (M.Ed.) work, I will say that this M.Ed. program was like a soft reset for my career. It has dumped enough of the old files that have built up over 20 years of teaching, that I am reminded of the idealism I entered the teaching profession with. Unfortunately, even though I have been refreshed by the M.Ed. experience, I have not managed to return to the clean-slate that was 1993. As much opportunity that this M.Ed. program should open up for me, the reality is that the path my career takes at this point is

unlikely to change all that much. Administration is out of the question as I burned that bridge long ago, and the roles I have taken on over the past 20 years are far too entrenched to break out of at this point. The only way I will be able to use my M.Ed. to change my role within the education system, is if I manage to find a new job in another school district.

Although I will not be climbing any ladders as the result of acquiring an M.Ed., I am able to apply my M.Ed. work to the roles I currently have in the education system. As a member of the district innovation and technology committee, I am able to draw from the work I did on the Pillars of Technology Implementation. In my role as technology implementation specialist, I am able to utilize the work we did on principles of learning design, to help teachers develop technology rich learning opportunities. Finally, in my role developing pro-D opportunities, I get to draw on my both professional experience and academic knowledge to try and effect a positive change in lives of teachers.

The one platform that may afford me the opportunity to parlay the work I have done on my M.Ed. into some sort of professional advancement, is my personal blog. Over the years it has resulted in several opportunities. I have been approached by recruiters on a number of occasions, have been invited to speak at several conferences and have been offered consulting work based simply from the work I have done on my blog. In fact, it was the writing I did on an iPad pilot program I participated in, that lead me to the opportunity to participate in this M.Ed. Program. It is through this medium that I have created a measure of notoriety in the Ed-Tech world and, with a M.Ed. to add some credibility to what I have to say, I may be able create even more opportunities for myself.

## **A Change in Thinking**

To be honest, I do not think this M.Ed. will result in much of a change my thinking or beliefs. I am still the teacher I have always been and that is probably a good thing because I am not what you would call a traditional stand-up teacher. If truth be known, I am a horrible traditional teacher and I learned this early on in my career. It was technology that allowed me to escape the burden of trying to be the teacher I went to university to become. As a result, I use technology liberally in all my classes; most of the learning in my classroom is inquiry-based and I fearlessly try new things on a daily basis. At the risk of sounding immodest, in many ways, I am already the teacher this Master's was intended to create.

The one thing that has changed in doing this Master's is the way I look at the relationship between administration and teachers. Under the tutelage of some wonderful senior teachers over the years, I had come to look at the workplace as a Teachers vs. Administration environment. A place where administration could only be tolerated not trusted. Although there are some administrators I have considered to be friends over the years, I did not have much faith in anyone who was not a union member. So entrenched was this outlook, I even tried to develop my project in a manner that would perpetuate this division. However, as I waded through the research on organizational change, I found it more and more difficult to maintain an "Us vs. Them" viewpoint. I came to realize that in order to effect any kind of positive change within a school, you cannot start off from a place of distrust.

## **Recommendations for Further Study**

I feel that much of the work I have done on this project is fairly rudimentary and there is plenty of opportunity to expand on the ideas explored. The key finding I think that could benefit from some more exploration, is the role of leadership on the implementation of technology.

Although I hesitate to suggest that leadership is the most important pillar of technology implementation, it is clear to me that the success of the other pillars is heavily dependent on good leadership. The key here is to realize that leaders can be found at all levels, from the classroom down to the ministry of education. Far more investigation could be done on defining how the work that leaders do at all levels, can affect the implementation of technology in an educational environment.

My second recommendation for anyone who cares to expand on my work, is to further explore the importance of providing teachers with the curriculum and resources they need to make technology in the classroom. My research has lead me to believe that the development of curriculum and resources for technology has slowly dispersed away from a central authority such as the ministry of education out to private interests or to the teachers themselves. Although this lends itself to greater diversity and innovation, it does not make for consistency across an educational jurisdiction. Perhaps more importantly, this diffusion of development creates an inequity of access to quality curriculum and resources for all teachers. This inequity is a significant problem and needs to be remedied if technology is to transform education in a way that we envision.

My last recommendation would be to start thinking about next steps. How to take this project and turn it into a digital tool that will compile answers to the questions and create a TIP based on those answers. At this point, I am not sure how best to go about this but it is something I may pursue in the future. Meanwhile, anyone who wants to put this together is more than welcome. I just want to see the finished product when they are done.

**To Wrap up**

It has been two-and-a-half years since I started this journey and I cannot help but think to myself “*What on earth am I going to do with all my free time*”? I cannot lie, I am happy it has come to an end, but I am also happy I took the time to complete my M.Ed.. It was nice to get back to doing academic work for myself, rather than creating academic work for others. Looking ahead, I cannot fathom what my next steps will be. Some say doing a M.Ed. is transformative to one’s career, but I guess only time will tell.

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