

# Implementing Technology Learning in the Public School System:

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The Challenges of Training Teachers to  
Use New Technology

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## **Introduction**

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Computers and information technology have become essential personal and business tools. (The Daily: Study: Connectivity and Learning in Canada's Schools, 2004). It is imperative that students across Canada develop sufficient computer and technology skills in order to compete in this increasingly connected world. School systems are faced with the organizational development challenge of training teachers to use technology in the classroom, integrate it with pedagogy and teach students to use technology to enhance and support their learning. In the following report, we will review some of the literature surrounding this issue and will propose and analyze two possible approaches. Finally, we will make a recommendation and provide a detailed action plan, including short, medium and long term activities.

## **Purpose of our Study**

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We wanted to investigate the challenges faced by the public school system when trying to bring in new technology that teachers can use to deliver curriculum to today's students.

## **Statement of the Problem**

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Teachers in the public school systems are from a very diverse demographic including multiple generations (The Daily: Study: Connectivity and Learning in Canada's Schools, 2004). The economic downturns of late have led to many older workers (55 or older) deferring retirement and extending their full time work periods (Tossell, 2012). It is difficult to devise a single implementation strategy that satisfies and effectively engages multiple age groups to integrate new technology strategies into their teaching. Public school teachers are members of a union; therefore the political nature of union work environments increases the complexity of technology change management.

## Background and Review of Related Information

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### Unions

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Unions seek to protect the rights of the working group for which they are representing and therefore will intervene whenever they perceive a threat. The structures and procedures that unions create are often misaligned with organizational objectives (Nicholson-Crotty, Nicholson-Crotty, & Grissom, 2009). Employee union membership may complicate an organization's change management strategy. According to Levi Niemen, "union groups are less likely to endorse norms and values that characterize highly effective organization cultures than their nonunion counterparts" ((SIOP), 2012). In Canada, public school teachers are represented by Teachers' Federations. In Ontario, we have the Elementary Teachers' Federation of Ontario (ETFO) and Ontario Secondary School Teachers' Federation (OSSTF) (Library, 2014). When school districts impose mandatory changes in teacher's job practices such as requiring the use of new technologies in the classroom, it is possibly they will be met with resistance and official challenges from union members and union management.

Organizational changes within union environments can be difficult, especially technological change. According to Paul Lawrence (1969), workers actually fear the change in relationships. This fear may drive older workers to resist the change and put pressure on their union to ensure they are able to perform their jobs more comfortably (Lawrence, 1969). Unions may see new technologies as a threat to teachers' jobs. Older teachers close to retirement may push unions to delay this change so they do not have to disrupt their existing teaching techniques. For this reason, it is imperative that school board management be prepared for resistance by the teachers' unions.

## The Change Management Process

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Change management is defined as a process that leads to a desired end-result (Lussier & Achua, 2013, p. 413). According to Lussier and Achua (2013), with change management, it is important to first identify and then analyze the need for change before embarking on any implementation plan. This includes the analysis of the organizations' internal and external environments in an effort to answer why change is necessary (Lussier & Achua, 2013). Change is both inevitable and a necessary survival technique. Without adapting to external forces of change, organizations may find themselves falling behind in development.

## Resistance to Change

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Resistance to change is caused by self-interest, misunderstanding and distrust, and a general intolerance for change (Williams et al., 2008, p. 288). People resist change out of self-interest because they fear that change will cost or deprive them of something they value. According to social psychologist Kurt Lewin, change is a function of the forces that promote change and the opposing forces that slow or resist change (Williams, Kondra, & Vibert, 2008).

## Resistance to Technology Change

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Using reliable and dependable technology is critical for educators, because such factors determine a teacher's intention on a technology, the technology's usefulness, and the accuracy of the data collected (Adiguzel, Capraro, & Willson, 2011). The Telecommunication Act of 1996 states that "As State and Federal legislation have invested in integration of new technologies into education, the teacher's role as the user of such technologies in the classroom becomes more prominent (Adiguzel et al., 2011). When new technologies are integrated into existing settings or processes, there is a risk that these resources may be inadequately utilized or misused. Legris declared that teachers' attitudes toward technology and its perceived usefulness are significant

determinants of behavior that may influence teachers' success in high-level use of technology in instruction. (Ertmer & Ottenbreit-Leftwich, 2010)

Ertmer and Ottenbreit-Leftwich (2010, p. 260) state that “to use technology to support meaningful student learning, teachers need additional knowledge of the content they are required to teach, the pedagogical methods that facilitate student learning, and the specific ways in which technology can support those methods”(Andrus, 2013). Adiguzel et al. (2011) present two perceptions regarding technology. The first perception is regarding the “ease of use” of the technology. The phrase “ease of use”, refers to the extent to which a person believes that using a technology will not require excessive mental and physical effort to implement (Davis, Bagozzi, & Warshaw, 1989). Teachers may feel compelled to learn about technology independently if they believe that using it will benefit their teaching, classroom management, and student outcomes. However, expecting teachers to independently pursue technology learning opportunities may be unrealistic on the part of administrators, because teachers are already overburdened and overextended with an array of responsibilities.

The second perception is regarding the intention to use technology. In the USA, the No Child Left Behind (NCLB) Act in the beginning of this decade included provisions for the expanding role of technology in American schools (Cradler & Cradler, 2002). The NCLB Act emphasized the importance of technology's adoption and utilization in special education classrooms, compelling special education teachers to ask whether and how they would incorporate technology into their classrooms, not only for instruction, but also for observation, monitoring, and evaluation purposes (Cradler & Cradler, 2002).

### The Impact of Change

When adapting to a new process, your perceptions and behaviours are likely to change as well. In the video “Who Moved my Cheese,” it is portrayed that change occurs in a cycle:

change happens, anticipate change, monitor change, adapt to change quickly and enjoy change (Johnson, 2013).

### Computers in the Classroom

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As of 2002, 86% of businesses used computers and 76% used the Internet; 65% of employees in the private sector had access to personal computers at work. (Statcan, 1998) These rates were even higher in government, where nearly all institutions used personal computers; 90% of their employees had access to a personal computer. By 2002, 60% of Canadian household had a personal computer and more than half of Canadian households (51.4%) had at least one member who regularly connected to the Internet from home (Plante & Beattie, 2004). The Information and Communications Technologies in Schools Survey (ICTSS) found that over 99% of all elementary and secondary schools surveyed in Canada had computers during the 2003/04 school year. (Statistics, 2004). In fact, more than one million computers were available, 90% of them with internet connectivity. (Statistics, 2004). Unfortunately, this same study indicated that there has been limited success in integrating computers into classroom learning.

### How well do teachers use computers?

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When surveyed, 76% of school principals reported that more than 75% of teachers possessed the required technical skills to use computers for administrative purposes - preparing report cards, taking attendance and recording grades (Statistics, 2004). However, fewer than half of them felt that most of their teachers had the necessary ability to integrate computers into their lesson plans or to get their students to use technology to improve their learning (Statistics, 2004). The ICTSS (Statistics, 2004) reported that mentoring/coaching activities with other teachers or ICT professionals was the most common strategy used to help teachers learn how to use computers. When surveyed, 38% of principals ranked coaching/mentoring activities as being highly effective (Statistics, 2004).

## The SAMR Model

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Throughout the organizational development stage, frameworks and models can be considered in order to optimize motivation and effective learning. OSAPAC, the Ontario Software Acquisition Program Advisory Committee refers to the SAMR Model, developed by Dr. Ruban Puentedura, as a way to help identify the opportunities for learning afforded by technology (OSAPAC, 2014). The SAMR model was created by Dr. Ruben Puentedura to explain the typical process that occurs when we adopt new technologies (See Appendix A (Puentedura, 2004)). Doctor Puentedura observed that technology learners often go through a four step process:

1. **Substitution** - During this stage, the technology acts as a direct tool substitute. (Puentedura, 2004), (e.g. using Google Docs as a word processor (OSAPAC, 2014))
2. **Augmentation** - In the next stage, the learner continues to use the technology but incorporates something new that enhances the task (Puentedura, 2004),(e.g. autosaving to the cloud) (OSAPAC, 2014)
3. **Modifying** - At this stage, the learner's continued use of the technology allows for significant redesign (Puentedura, 2004), (e.g. students can collaborate on one document and use the comment feature to provide immediate feedback) (OSAPAC, 2014)
4. **Redefinition** - In this stage, the learner begins to use the technology for new tasks that were previously unimaginable (Puentedura, 2004), (e. g., creating a piece of writing or a presentation collaboratively with students across the world including words, images and narrative and posting it to a website for a global audience) (OSAPAC, 2014)

Understanding this framework will facilitate the development of optimal planning and implementation strategies to introduce new technologies to teachers and students (Puentedura, 2004).

## Case Study

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### Beyond Installation: Effective use of Interactive whiteboards in Yukon Classrooms (Andrus, 2013)

Between May 2010 and January 2011, the Yukon Public School studied their implementation and usage of interactive whiteboards (IWBs) focusing on teacher learning and pedagogical practices facilitated by use of the Promethean Interactive Whiteboard and the ActivClassroom software. During this study, 20 IWBs were installed in the schools (Andrus, 2013). The purpose of the study was to determine the extent to which teachers in the Yukon were making effective use of interactive whiteboards in their classrooms to create interactive learning environments. Included in the IWB's technology are: ActivBoard, a connected computer or an ActivPen as a replacement for the computer's mouse, a projector, the ActivInspire Software, and peripherals such as the ActivSlate or the Learner Response System. Following the installation of the ActivBoards, some teachers flourished with the new challenges while others floundered and were frustrated to the point of no longer wanting the responsibility of learning how to use the new technology (Andrus, 2013). Many of the issues were resolved using troubleshooting tips and shared experiences. By the end of the study, they concluded that the Promethean ActivClassroom technology facilitated flexibility in teaching and actually saved teacher time. When asked, the teachers described the joy of witnessing enhanced student engagement (Andrus, 2013). Even teachers who had wanted their boards removed were now successfully using the technology in their classrooms and were excited about the potential impact on their students' learning (Andrus, 2013). The study concluded that the ActivClassroom also supported teachers' ability to use a less directive approach in teaching. It facilitated constructivist teaching that included the opportunity for discussion collaboration, inquiry and use of critical thinking skills (Andrus, 2013).

## Analysis of the Situation

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Many large school districts are moderately mechanistic and bureaucratic in nature. There is a defined organizational structure and most decisions need to go through channels. Authority

is highly valued and seniority is rewarded through prescribed, union negotiated pay scales. Most projects proceed at a low or moderate pace, as quality is valued over efficiency. Schools follow set, written rules of conduct and deliver detailed curriculum to students.

### Interests, Conflicts, and Power: How the Public School System is like a Political System

When considering the organizational development challenge of implementing new technology in a Public School District, we decided to view it through the lens of a political system. Due to its mechanistic and bureaucratic structure, Public School District decision-makers will likely impose technology changes from the top down, without consulting those who will need to use it daily to teach their students. This may increase political tension, conflict and instigate a power struggle. Gareth Morgan (2006) analyzed organizational politics by looking at the relationship between interests, conflicts and power in the workplace. These three aspects of organizational politics can be used to analyze the effects of introducing new technology into the public education system.

#### Interests

Naturally, each group in an organization tends to focus on their own best interests. Teachers may be most concerned about job security, promotions and receiving respect at work. Unions may be interested in acquiring power, remaining strong and in self-preservation. Management tends to focus on achieving set goals and missions within prescribed budgets while maintaining and increasing their own power within the organization. Since all actors involved have differing points of interest, conflicts are inevitable.

#### Conflict

For teachers, their unions, and the Ontario school boards, these interests may collide during periods of great change, such as the implementation of new technology. School boards may want to improve and modernize methods of education delivery using cutting edge

technology, while teachers may want to be autonomous, effective educators that can choose how they deliver curriculum and engage young minds. Unions want to protect the teachers' contractual rights and buffer them from unnecessary or counterproductive change.

### *Power*

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The third aspect of a political system involves power. As new technology is selected, purchased and implemented, power is wielded in an effort to influence what technology is chosen, where it will be used and how it will be implemented. Technology enables people to achieve amazing results through increased productivity and cost-efficiency. However, "The kind of technology employed influences the patterns of interdependence between different individuals and departments" (Morgan, 2006, p. 179). As the schools implement new learning technologies, tasks in the teaching profession will be affected. Since many teachers are accustomed to a certain teaching style, this change will become a point of contention. For example, in previous years teaching mathematics would require solving problems on the class chalkboard. Students would rush to copy down information before it was erased. With new electronic whiteboard technology, teachers can record and save written and spoken classroom lessons to be shared with students for home review. While this may be a great way to assist a student who missed the class, it may also cause the teacher great discomfort. For example, technical issues with using technology can be very disruptive and the ability to access information at their leisure may make some students less motivated to learn in class. This may frustrate teachers and lower their job motivation.

When considering the political metaphor, one must remember that unions operate as a sub or counter culture within the organization. The Union exists as a "check" on the organization, so it would be prudent to consider Union influence during change management decisions-making.

Having employee, management and union buy-in before executing a change process will reduce conflict and simplify the implementation. Teacher unions are large powerful entities that have a

substantial amount of legitimate power. When these three interests collide, there is a potential for labour actions such as work-to-rule or even labour strikes.

Political activities can also occur on a smaller scale, within each school. Coalitions can form to impede or block changes. Teachers close to retirement may lobby to keep their current teaching tools, despite those methods being outdated. Unions may intervene on their behalf and try to cancel or modify the change process. Therefore, when introducing this new technology, it is important for decision-makers to be aware of potential political pitfalls and to take the time to include all parties affected by the change in an effort to manage the behaviors and outcomes associated with the process of change.

### The Psychic Prison and how it applies to this specific change management challenge

The public education sector and its teachers can be analyzed using the metaphor of organizations as psychic prisons. The nature of the psychic prison promotes favoured ways of thinking that ultimately imprison an older worker to the natural ideas, thoughts and actions and therefore, prevents the emergence of new challenges (Morgan, 2006, p. 207-209). Older teachers need substantial time to acquire and transfer the classroom knowledge and skills in order to infuse technology effectively into their daily practice (Brand, 1997). Employees in every organization can become trapped in a set way of thinking which can make them resistant to change. They become imprisoned by the images, ideas, thoughts and actions to which they accustomed in their day-to-day activities.

### Options to Manage This Issue

We considered several approaches that school districts could use to manage technology change.

#### Option One: Imposed Change using rapid, school wide and district wide training sessions

The School board could try to force teachers to accept the inevitable change by imposing strict deadlines, mandatory training and testing, and negative consequences of resistance, perhaps

by gradually replacing older or tech resistant teachers with younger, more technically savvy teachers. The training would involve rapid, school wide and district wide training sessions to be conducted over two consecutive professional development days, with all teachers taking the same training at the same time.

### Pros

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The new technology can be rolled out quickly as the organization will not be wasting time convincing employees that the change is both necessary and beneficial to them. Imposed change may initially seem less expensive to implement as hiring and firing practices will bring in younger, entry level teachers who are paid less than older, experienced teachers and may require fewer hours of training due to their inherent digital skills. This approach is an efficient, cost effective way to quickly deliver “Sage on the Stage” style training to the maximum number of people in the minimum amount of time. Every teacher will be given “one-size-fits-all” training, which will hopefully result in consistent technology abilities across the district.

### Cons

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The downside of imposed change programs include increased union conflicts as they try to protect older teachers’ rights, alienation or loss of great, experienced older teachers and reduced employee morale due to lack of choice and power. In the long run, this approach may cost more money due to increased employee turnover costs, strike actions and severance payments to long-employed teachers who are released. It is likely that teachers will grudgingly comply, but then quickly revert to old techniques and abandon the new technology use in class, altogether. Unfortunately, this training style may expose them to the new technology, but it will not adequately equip them to immediately integrate the new technology into their teaching. People learn at different speeds and in different ways. In addition, this training will likely be

costly as the schools will need to be closed and teachers will need to be reimbursed for any travel or accommodation expenses in addition to their regular pay.

### Option Two: Pilot Project Approach with Ongoing Training and Mentorship

The Pilot Project Approach is a time-phased roll out of the new technology and training. In the first phase, the technology will be installed in three classrooms per school. Each school will send three teachers to train on the technology over multiple sessions. They will receive fast, personal support in between sessions and will try to become a "resident expert" with a goal to champion and lead school-wide training and implementation of the new technology over the next year.

#### Pros

This will limit the number of devices and new learners requiring support, enabling technical support agents and the technology leader to give extra time and attention to the pilot project teachers in an effort to accelerate and guarantee their adoption of the new tools and teaching methods. The newly trained teachers will act as mentors to the next phase of learners, which will support the SAMR Learning Model (Puentedura, 2004). This approach will allow the inevitable technical glitches and issues to be exposed and handled early in the project, in a controlled and manageable way. As these problems are resolved, the leader can record and update training modules and techsupport databases which will improve the next phase of learning. Teachers may enjoy being a peer mentor, and their colleagues will likely prefer to learn from their peers rather than software vendor trainers.

#### Cons

Enthusiastic teachers that are not chosen for the pilot project may feel angry and underappreciated which may affect morale. The "resident expert" teachers may feel overwhelmed with the additional responsibility of supporting their colleagues. Union

representatives may still be contacted by teachers concerned about access fairness and workload imbalances.

## **Recommendation**

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After carefully considering the pros and cons of each approach, we recommended Approach Two, the Pilot Project Approach.

## **Implementation Plan**

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### **Short-term Implementation Plan: One to three months**

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Prior to starting the technology training, it is very important to release a top management support message to all teachers explaining the exciting new technology and the pilot program schedule (Brand, Winter 1997). The document should include links and telephone numbers that teachers can use to get more information and to apply to be one of the early adopters. In addition, top school district decision-makers should approach the teacher's union to inform them that new technology has been purchased and will be implemented soon. This will reduce the chances of union push-back and will prepare them for teacher complaints. Budgets should be modified to allow for teacher release time to learn the new technology well and to incorporate it into their daily teaching plan (Brand, 1997). When designing the developmental sessions, invite input from the pilot program teachers. Perhaps these teachers can take a short survey to assess their different skill levels and to learn what is motivating them to participate in this pilot program. This will give the trainers an indication of the varying needs and skills of the participants (Brand, 1997). Brand references studies by Pope, Shelton and Jones, suggesting that trainers: (1) Identify teacher's current interests and needs before the instructional session; (2) Provide customized training to meet the unique needs of each teacher; (3) supplement participating teachers' strengths; and (4) match teaching and learning styles (Brand,1997). On-going support of peer coaching is an important method to address the unique learning needs of individuals. Gaining

trainer experience will allow teachers to illustrate effective use of technology resulting in reduced fear and increasing confidence. Having support in place enables the alignment of staff development with the school system's intended goals.

### Medium-term Implementation Plan: Three to six months

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A section of the school district's website intranet should be dedicated to hosting short, on-demand tutorial videos that the pilot program teachers can access in private. A toll-free technical support number should be set up to reach either an IT professional or a full-time technology leader who understands both the technology and pedagogy. By this time, each school will have selected three teachers to receive technology training to become a "resident expert" and act as a peer mentor. It is important that these early adopters receive non-monetary rewards such as published recognition and opportunities to travel to education conferences to share their experiences. Also, a reasonable financial incentive as a reward for their commitment will offset the extra work and time required to reach competency (Brand, Winter 1997). Training sessions for the new wave of teachers should be scheduled over multiple sessions, with a maximum of 20 participants per session. This maximum is important to allow teachers enough time to try the new tools and practice required skills in a safe, supportive environment. Each session should be offered multiple times to accommodate participant schedules and allow repeat attendance if needed. School mentors should set up smaller before and after school sessions on site. Training modules should emphasize ways the new tools will save teacher time, promote student engagement and achieve ministry expectations. (Hew & Brush, 2006).

### Long-term Implementation Plan - 6 months to one year

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After six months, it is important to survey the pilot participants in an effort to improve training sessions in preparation for the next phase. At this time, the decision-makers should publicly celebrate the progress thus far, offering thanks to those who have embraced the new

technology. After two weeks of review, the program should be expanded to include all remaining classrooms and teachers. School administrators should establish flexible training schedules and release time away from the school to allow teachers to focus on learning the new technology. The school's "resident expert" should encourage new participants to integrate the new technology with their lesson plans on a daily basis. The pilot program teachers should be encouraged to champion and lead school-wide training and implementation of the new technology over the next year and beyond. New teachers should have the opportunity to visit other classroom settings to observe the new technology integration (Brand, 1997). By promoting and facilitating team and peer coaching, teachers will be able to practice what they have learned in a productive manner. The rewards and incentive program should be expanded to include students. Invite them to come up with ways to complete their assignments using the new technology. Small prizes and achievement certificates should be awarded for creative student submissions.

## **Conclusion**

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Technology change management is a complex organizational development issue that requires careful planning and consideration. Within a union environment, the complexity is increased by conflicts, differing interests and power struggles. School district decision-makers must take the time to consult with stakeholders in an effort to create an effective technology implementation plan. We recommend they use a pilot project approach to roll out the technology and training in phases. It is critical that all parties clearly understand how this change will improve their daily teaching tasks and most importantly, how it will engage and educate today's students to be prepared to excel in today's highly connected and technology focused job market.

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## Appendices

APPENDIX A (Puentedura, 2004)

