Determinants of Change and Technology Adoption in K-12 Schools

By

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We acknowledge with respect the Lekwungen peoples on whose traditional territory the university stands and the Songhees, Esquimalt and WSÁNEĆ peoples whose historical relationships with the land continue to this day.

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Abstract

This project focuses, from the perspective of a school administrator, on determinants of change and technology adoption in K-12 schools. The focus of this study is identifying factors that cause teachers to change and adopt technology into their practice. Research and literature into theory of change, technology adoption theories, and some psychological constructs are explored. Chapter Three includes a technology plan template which has components and questions to consider based on the researched theories. In order to create effective change within a school, one must be intentional in planning and include components at both a systemic and individual level.

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Chapter 1: Introduction

"In the last 20 years, technological advances have resulted in new opportunities to use technology to improve learning and instruction. As a result, there is an increasing demand on teachers to develop the skills to make effective use of technology" (C. Kim & Baylor, 2008).

Technology is pervasive in almost all areas of society. Within this, two trends can be observed: First, education systems around the world are incorporating digital literacy competencies into curriculum (Beller, 2012; Flores et al., 2017; Siddiq et al., 2016). Second, educators are encouraged to include technology in their teaching – as a tool to facilitate learning and assessment (Shute & Rahimi, 2017; Straub, 2009). If the aim of education is to help students to become digitally literate, then teachers need to feel confident to do the same. Schools need technology leaders in order to inspire educators to incorporate the most appropriate technology in an efficient and meaningful manner (Beedle & Wang, 2013). Therefore, for leaders, a specific focus needs to be on the strategic planning, implementation, and process of technology adoption for teachers in the K-12 sector (Scherer et al., 2015).

My Story

Currently, I am a teacher and new administrator in an elementary school in West Vancouver, British Columbia. For the past 15 years, I have enjoyed engaging online both personally and professionally. Growing up, I learned how to use a computer to communicate my ideas and a cell phone to stay in contact and connection with others. As I progressed through the teacher education program, I learned how to harness new technologies and applications in order to engage my students in a new way. I still get excited learning about new technologies and skills that I can bring into my classroom. However, I understand that not everybody has that experience.

Especially as I have transitioned into the administrative landscape, I have noticed that everyone has a different access point and level of comfort with technology. I really appreciate all the resources, suggestions, and supports in place to help educators, however, I feel they are not being used in a way that will sustain engagement and intentional effective use going forward. As a new leader, I want to know how to facilitate change and how I can best support my staff in this journey.

Research Problem and Purpose

Societies and its systems have been shifting with the impact of the internet and technology, but the K-12 system in Canada, while it has made some adaptations, has not fully integrated it into the pedagogy of practice (Hew & Brush, 2007). Without a national education department, the promotion of skills, technologies, and learning falls to provincial and territorial authorities with varying levels of commitment. There is "no common consensus on what teaching" and learning "digital literacy in schools should look like, and consequently, schools are not organized to promote digital competence" (McLean & Rowsell, 2019, p. 201). This creates confusion and lack of engagement for educators when it comes to integrating technology into schools and classrooms in an intentional and thoughtful way.

British Columbia is one of the provinces that has started to integrate technology literacy into mandated curricular content with the addition of the Applied Design, Skills, and Technology curriculum (2018) and the Digital Literacy Framework (2013) (British Columbia Ministry of Education). These curricular competencies and framework allow educators to start engaging with technology but can be viewed as an add-on to what they are already doing. Quality integration of technology and digital literacies should be "included with purpose and meaningfully implemented based on pedagogy" (Willis et al., 2019, p. 63). Therefore, the purpose of my study

will be to identify factors that help facilitate systemic change and technology adoption in K-12 schools and apply it to the creation of a school technology plan template.

Project Overview

For this project, I will explore two theories, change theory and technology adoption theory, which have been used to identify factors that facilitate change and technology adoption in schools. I delve into aspects of the theories and how they have been applied in the K-12 context. From there, I will create a comprehensive technology plan template for administrators outlining the key sections and questions to consider when creating a plan. I will use this template as a reference to help my current school staff in developing a collective pedagogy of technology use and skill development across the grades. This, in turn, I hope will create a sustained shift in our approach and level of comfort with technology.

Search Methods

In the search for applicable and resourceful articles, the most useful databases for the topics included JSTOR, SAGE, and Google Scholar. Peer-reviewed and scholarly articles were chosen from the past five years. Below is a list of some of the keywords used to search for information on the University of Victoria online library database:

“educational change”

“leadership characteristics”

“change theory” AND “education”

“change theory” AND “education” AND “technology”

“technology adoption theory” AND “teachers”

“teacher motivation” AND “technology”

“perceived usefulness” AND “teachers” AND “technology”

Chapter 2: Theoretical Framework and Literature Review

There are many competing definitions of leadership, especially in the field of educational technology. Although, as Fullan (2007) notes, “the litmus test of all leadership is whether it mobilizes people's commitment to putting their energy into actions designed to improve things. It is individual commitment, but above all it is collective mobilization” (p. 9). Leaders are having to direct a pathway for their teachers in a field of education that is constantly changing and producing challenges that classroom teachers have never seen before.

In order to develop new skills in staff and students, it needs to be modeled by leaders. There is a big difference between management and leadership. Managers enforce decisions which ensure the efficiency of a process, but leaders demonstrate qualities and ways of being in which they are looking for from members of the institution. As Durak (2018) summarizes, “management is doing things right; leadership is doing the right things” (p. 3). See Figure 1 for specific differences between management and leadership when it comes to direction, alignment, relationships, personal qualities, and outcomes.

In order for leaders to lead educators in an area of growth and change, they must first understand the factors that promote and build the foundations for change. Change theory is a comprehensive description and illustration of how and why a desired change is expected to happen in a particular context. In regard to the field of education and how leadership can impact change, Michael Fullan has done extensive research and work in this area (2001, 2007, 2010, 2014, 2018, 2020).

Figure 1

Ryan's Model of Leadership Versus Management Adapted from John Kotter (1990). From Ryan, R. (2007). Leadership development: A guide for HR and training professionals. Butterworth-Heinemann.

	Management	Leadership
Direction	Planning and budgeting Keeping an eye on the bottom line	Creating vision and strategy Keeping an eye on the horizon
Alignment	Organizing and staffing Directing and controlling Creating boundaries	Creating shared culture and values Helping others grow Reduce boundaries
Relationships	Focusing on objects – producing/selling goods and services Based on a position of power Acting as boss	Focusing on people – inspiring and motivating followers Based on personal power Acting as coach, facilitator, servant
Personal Qualities	Emotional distance Expert mind Talking Conformity Insight into organization	Emotional connections (Heart) Open Mind (Mindfulness) Listening (Communication) Non-conformity (Courage) Insight into self (Integrity)
Outcomes	Maintain stability	Creates change, often radical change

Technology use and access has changed dramatically over the last decade. Educators have a wide variety of exposure, experiences, and understanding of the technologies around them. As a result, there is a wide variety in the level of integration and adoption in each classroom. Technology adoption “is a complex, inherently social, developmental process; individuals construct unique yet malleable perceptions of technology that influence their adoption decisions” (Straub, 2017, p. 645). School leadership plays a crucial role in the instructional reform of technology (Sun & Gao, 2019). The digital culture that we live in today warrants a new type of leadership style, by moving away from traditional leader-centric forms of leadership to something more transformational. Franciosi (2012), points out that educational leadership should be more flexible to cope with technology driven changes and development.

There are very specific factors and structures that need to be in place for systemic change to happen in the field of educational technology within a district or school.

The understanding and comparison of theoretical frameworks that surround educational change and, more specifically, technology adoption, will help leaders develop an understanding of what influences educator's decision-making, propensity for change, and intentional and effective adoption of technology.

Theory of Change

Change Theory or Theory of Change (ToC) is a specific methodology for planning that is used in many industries to promote social change. The ToC emerged from the field of program theory and program evaluation in the mid 1990's as a new way of analyzing motivations for social and political change (Weisse & Connell, 1995). Change and the ability for growth and development is built into the fabric of human evolution. As Fullan (2020) says, if you do not change, you become obsolete or extinct. In the field of education, it is used to understand the factors that foster change in order for leaders to make informed decisions about strategy and tactics. A change in culture needs to be clear and specific for all participants. Therefore, there is a need for focused and intentional leadership when pursuing a cultural shift or change in educational practice.

Change theory "can be very powerful in informing education reform strategies, and in turn getting results, but only in the hands (and minds, and hearts) of people who have a deep knowledge of the dynamics of how the factors in question operate to get particular results" (Fullan, 2007, p. 27). Quality leaders start by listening and learning, finding out where people are, valuing what they bring to the table, and building from there (Heifetz & Linsky, 2017). From there, they then look to the seven principles set out by Fullan to develop a structure, process, and

environment where change is most likely to happen: motivation, capacity building, learning in context, changing contexts, reflective action, tri-level engagement, and persistence and flexibility (2007).

The first principle of ToC, *motivation* (Fullan, 2007) is what motivates people is highly subjective and dependent on a variety of different aspects – moral purpose, capacity, resources, peer and leadership support, identity, and so on. It is imperative to understand the motivations of individual staff in order to harness and direct it towards targeted collective change. This is not a state, but a dynamic and ever evolving process (Fullan, 2020). In addition, it is important to understand, as a leader, how your behaviours and actions motivate change in others. If you do not treat others well and fairly, you will be a leader without any followers. As a leader, if your "theory of action does not motivate people to put in effort, individually and collectively, necessary to get results, improvement is not possible" (Fullan, 2007, p. 32).

The second principle of ToC is *capacity building* with a focus on results. Capacity building is defined as "any strategy that increases the collective effectiveness of a group to raise the bar and close the gap" (Fullan, 2007, p. 33) of learning. This means developing individual and collective knowledge, competencies, and resources on a topic. The nuance in leading this change is to reframe the work as a learning problem, not an execution problem. In order for large-scale reform, there needs to be a balanced combination of pressure and support. This 'positive pressure' motivates, is fair and reasonable, and does come accompanied by resources (Fullan, 2007). By building new capacities, it creates a natural route to motivation; which is the basis of intrinsic motivation.

The next principle for reform and change is that there must be many *opportunities for learning in context* (Fullan, 2007). This means that there must be opportunities for educators to

focus on learning about their practice in the settings in which they actually work. For some teachers, this could mean professional development opportunities within the school and/or district or observing/being observed by a colleague. These are routines and practices that can be built into the structure of school professional growth and development plans and modeled by school leaders. As Elmore (2004) states, school

> cultures do not change by mandate, they change by the specific displacement of existing norms, structures, and processes by others: the process of cultural change depends fundamentally on modelling the new values and behaviour that you expect to displace the existing ones. (p. 11)

Changing context is another principle of ToC. This means the ability to see things from different perspectives. By partnering up or having discussions with a variety of educators focused on the same outcomes, this builds 'lateral capacity building' in which individuals are learning from each other (Fullan, 2007). By doing this, the shared vision and learning increases ownership of learning and long-term integration.

The next principle for ToC is a bias for *reflective action*. Reflective action means taking an impartial look and reflecting on what has been done to meet a goal. This should be a critical step of the process towards change. The ability to reflect back, communicate things that went well, and did not go well will help to internalize the learning and make it more personal. This principle goes back to Dewey's (2016) findings that people not only learn by doing but that they learn by thinking about what they are doing. It is the purposeful thinking and reflecting part that counts, not just the mere actions. This strategy "is an interactive process, not a two-step sequence; it requires continual feedback between thought and action" (Mintzberg, 2004, p. 52).

Another important principle of ToC when it comes to educational reform is *tri-level engagement*. This means that school, community, and district representatives are engaged in conversation around change. It is expected that not all perspectives will align completely on the topic of change, however, leaders must strive to foster a 'permeable connectivity' (Fullan, 2007). This means "pursuing strategies that promote mutual interaction and influence within and across the three levels" (Fullan, 2007, p. 35).

The final consideration in the ToC is *persistence and flexibility* in staying the course. The facets mentioned above are all complex to manage and must be cultivated over time. The process will include bumpy cycles, but it is necessary to stay the course as an educational leader. Change inevitably arouses emotions from people, and when emotions intensify, leadership is key (Fullan, 2020). This process of cultural change takes resilience on the part of leadership and staff. Resilience is a combination of persistence and flexibility.

Technology Adoption and Diffusion Theories

It is an individual's adoption pattern that illustrate a successful implementation of change. Therefore, it is essential to understand aspects of the process such as: "Why does one individual choose to adopt technology while another resists? What is the influence of social context on the decision to adopt?" (Straub, 2017, p. 625). These questions are explored in the context of adoption and diffusion theories. Adoption theories examine the individual and the choices they make to accept or reject a particular innovation. Diffusion theories describe how an innovation spreads through a population. Therefore, "diffusion over time is composed of individuals making adoption decisions" (Straub, 2017, p. 626). There have been many adoption and diffusion theories over time. With each iteration, researchers are considering more factors that could affect individuals and collective adoption of technology.

The Theory of Reasoned Action (Fishbein, 1967) is a popular theory as a way to understand the relationship between intention versus action and attitudes (Straub, 2017). It was widely used as a model for the prediction of behaviour and behavioural intentions. This theory suggests that "behavioural intention, which are the immediate antecedents to behaviour, are a function of salient information or beliefs about the likelihood that performing a particular behaviour will lead to a specific outcome" (Madden et al., 1992, p. 3). According to this early theory, the three conditions that can affect the magnitude of the relationship between intentions and behaviour are (Madden et al., 1992):

- The degree to which the measure of intention and the behavioural criterion correspond with respect to their levels of specificity
- The stability of intentions between time of measurement and performance of the behaviour
- The degree to which carrying out the intention is under the volitional control of the individual

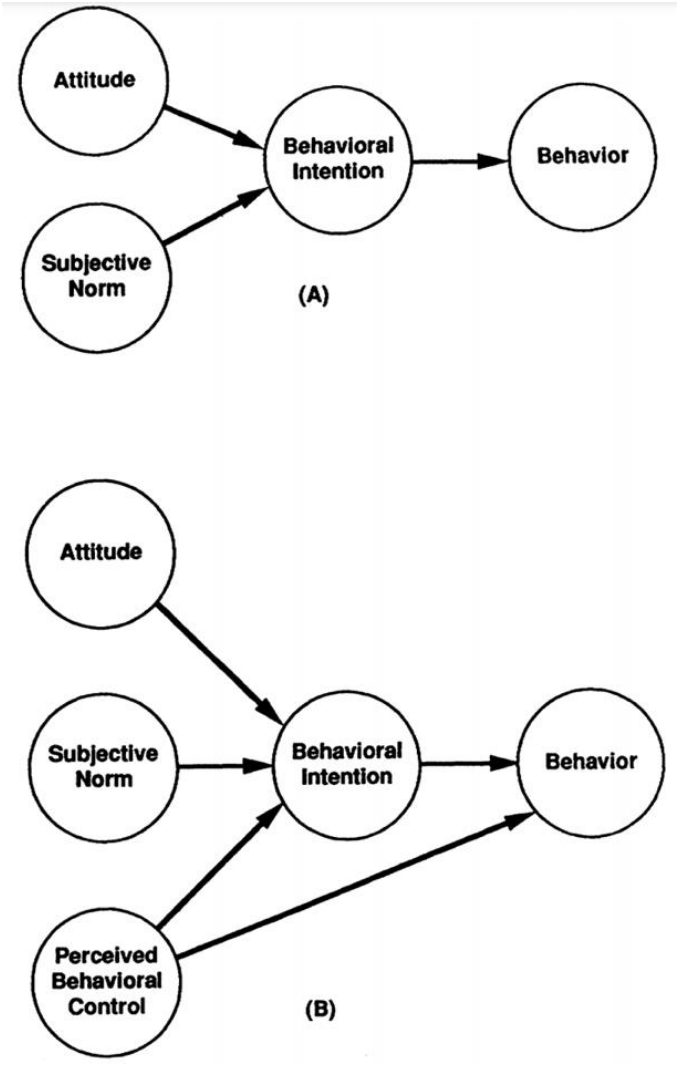
In this model, level of intention is highly indicative of demonstrating the desired behaviour.

The Theory of Planned Behaviour (Ajzen, 1991) is an extension of the previous model, however, it "explicitly incorporates perceived behavioural control as an antecedent to behavioural intentions" (Madden et al., 1992, p. 3). For example, one type of perceived behavioural control could be access to resources and opportunities. If an individual thinks that they possess these things, their perceived behavioural beliefs should be greater (Madden et al., 1992). Therefore, on the opposite end of the spectrum, if people believe that they have little control over performing the behaviour because of lack of resources and opportunities, then their

intentions to perform the behaviour may be low. This applies, even if they have a positive attitude about their performance of the task (Madden et al., 1992).

Figure 2

Madden et al.'s Path Models for the Theory of Reasoned Action (A) and the Theory of Planned Behaviour (B) Exogenous Correlations were Estimated; Paths Left of our Figure for Simplicity (1992). From Madden, T. J., Ellen, P. S., & Ajzen, I. (1992). A Comparison of the Theory of Planned Behavior and the Theory of Reasoned Action. Personality and Social Psychology Bulletin, 18(1), 3–9.



Everett Rogers (1962) work, *The Diffusion of Innovations*, has arguably become "the most influential book in the area of understanding how innovation infiltrates a population (or not)" (Straub, 2017, p. 629). Rogers' innovation diffusion theory draws on a wide range of research, crossing fields of geography, sociology, education, psychology, and others. There are four primary components of diffusion theory: the innovation, communication channels, social system, and time (Straub, 2017). In regards to innovation, there are five attributes that help to influence its adoption: the perception that it will be better or worse than similar ideas, the perception that it is similar and congruent with existing understandings, the perception of how difficult it is to comprehend, the accessibility of an innovation to an individual for exposure and experimentation, and how available and visible it is to an individual (Straub, 2017). Communication channels are the means and mechanisms in which information is passed from individual to individual about a particular innovation. This could be through direct communication, observations, and even influence of mass media. The social system is the context, culture, and environment that the individual exists within. The way that time is referenced in diffusion theory research is based on time of adoption (e.g., early, mainstream, and late adopters) (Straub, 2017). This diffusion theory is helpful to understand why adoption occurs, but it lacks prescriptive direction on how to facilitate adoption.

The Hall's Concerns-Based Adoption Model (1979) "provides a developmental perspective on how an individual's concerns influence his or her integration of an innovation" (Straub, 2017, p. 632). It approaches innovation adoption through the eyes of adoptees (teachers), by addressing concerns from a developmental perspective. Using this model can help school leaders gain insight on how teachers will adapt to change and provide a framework to anticipate future needs. The three components of the concerns-based adoption model are: stages

of concern, levels of use, and innovation configuration (Straub, 2017). It is designed as a diagnostic tool. The three components can help support school leaders in understanding how to best facilitate the adoption of an innovation.

The Technology Acceptance Model (TAM) (Davis, 1989) was influenced by social cognitive theory and decision-making theories and was some of the first research to study "how an individual's perceptions of a technology innovation affect the eventual use of that technology" (Straub, 2017, p. 638). In his research, Davis identified two characteristics about innovation that he believed to predict outcomes of use: perceived ease of use and perceived usefulness. Perceived ease of use means how accessible the innovation is and how it fits into an individual's existing schema of understanding. Perceived usefulness is the "degree to which a person believes that using a particular system would enhance his or her job performance (Straub, 2017, p. 638). This work began the conversation around the importance of individual perceptions of a technology or innovation. Perceived usefulness "has been found to be a consistent influence of future individual use of a technology" (Adams et al., 1992, p. 236). What this model does not take into account, however, is any other characteristics that may influence an individual's attitudes around technology such as prior experience, age, and gender.

The United Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003) is a collection of important characteristics from previous models. There are four key determinants of use and four moderators of individual use behaviours (Straub, 2017). The key determinants of use are: performance expectancy, effort expectancy, social influence, and facilitating conditions (Straub, 2017). The four moderators are gender, age, experience, and voluntariness of use (Straub, 2017). This has taken into account the gaps noticed in the TAM; however, researchers are now curious how the emotional toll of change affects adoption theory.

In most recent research, “successfully facilitating technology adoption must address cognitive, emotional, and contextual concerns” (Straub, 2017, p. 625).

It is important to note that adoption does not always equal acceptance. Educational leaders understanding and facilitation of the process – and understanding of the common characteristics - may be more important than the adoption of an innovation itself.

Comparison of Theories

The theories mentioned above outline important factors to consider when planning for technology change in the K-12 education system. However, it is hard to compare the factors of both change theory and technology adoption theories as they are at different system levels. Change theory factors focus primarily on structures or routines that need to be put in place in order to create the environment for change, such as, building capacities, reflective action, and tri-level engagement (Fullan, 2007). Whereas, the technology adoption theories, especially the TAM and UTAUT, focus on individual factors such as age, gender, perceptions, and social influence (Venkatesh et al., 2003).

A Closer Look at Outcomes of Technology Adoption Theories in Education-Focused Literature

The TAM and UTAUT theories have often been used in research when measuring technology adoption with K-12 teachers (Birch & Irvine, 2009). The recent research on the application of these theories and outcomes that have allowed for successful adoption and implementation of technology, will allow for educational leaders to better plan for and support teachers through the process of change.

TAM

The TAM helps to explain user acceptance of information technology, specifically, their behavioural intention of technology acceptance. The model recognizes that users perceived ease of use (PEU) and perceived usefulness (PU) of technology determine whether individuals intend to adopt the said technology (Davis, 1989). PEU describes an individual's perceptions of the effort level needed to use technology and PU explains the extend two which people believe that using technology will enhance their job performance (Davis, 1989). PEU has been shown to be an antecedent to PU because technology that can be easily applied is perceived as more useful than hard-to-apply technology (Venkatesh et al., 2003). The 'intent to use' is one of the strongest predictors of technology usage and is well established in researched literature (Davis & Venkatesh, 2004; Lee et al., 2003).

The initial iteration of the TAM was created in the 1980's, but since then, additional variables have been added to extend the scope of research. The TAM2, added social influence and cognitive instrumental processes as the basis of PU. And the TAM3 (Venkatesh & Bala, 2008) included the addition of self-efficacy as a determinant of PEU. These iterative frameworks have proven helpful in understanding how to reinforce teachers intentions of implementing technology in K-12 settings (Tang et al., 2020).

Application of the TAM

In order to examine how TAM has been used to investigate technology integration in schools, I will look at the application of OER, LMS, and E-Learning in a few specific settings.

Open Educational Resources (OER) Adoption. This mixed methods inquiry integrated both qualitative and quantitative approaches to obtain a comprehensive understanding of teachers intentions of adopting OER in K-12 settings (Tang et al., 2020). The quantitative findings were

gathered through the survey questions and the qualitative findings were gathered through participant reflection notes. Findings from the quantitative phase confirmed that PEU and PU successfully predicted K-12 teachers intention to adopt, with attitude mediating the effect (Tang et al., 2020). PEU determined PU, and both variables influenced teachers attitudes towards OER (Tang et al., 2020). However, PU was validated as the most significant predictor of their attitude and intention (Tang et al., 2020). Findings from the qualitative phase presented insights into the quantitative findings by discussing teachers perceived strengths and weaknesses through the lenses of PEU and PU (Tang et al., 2020). These findings validate and build on previous research that teachers PEU determines their PU, attitude, and intention to adopt OER (Jung & Lee, 2020; Kelly, 2014; Kim et al., 2015).

Learning Management System Adoption. Learning Management Systems (LMS) have been present in post-secondary institutions for years and in recent years, there has been more availability of them in K-12 (Stockless, 2018). In this study, researchers used a questionnaire based on the TAM model which was sent out to more than 1000 secondary school teachers digitally. Based on the results, PU was a good predictor of the attitude towards use and the intention to use the technology (Stockless, 2018). In this particular study, PEU did not come up as a concern (Stockless, 2018). This could be because response to the questionnaire was voluntary and researchers were not able to focus on teachers who were unfamiliar or new users of the LMS. The LMS in question was perceived as very easy and straightforward to use. If the context was changed, this might change the PU factor. However, the data from this study still suggests that PU of the LMS is a good predictor of intention to use (Stockless, 2018).

E-Learning for Professional Development Adoption. An effective way to encourage technology adoption among teachers is to use professional development to improve their

attitudes towards technology (Li et al., 2016). This study in particular focuses on how the TAM can predict teachers' intentions to continue using e-learning for professional development based on PEU and PU (Smith & Sivo, 2012). Smith and Sivo expanded on the original TAM factors to encompass users' perceptions of social presence (SP) and sociability (SOC). Researchers vary in their interpretation and definition of SP, which makes it difficult to pinpoint an exact definition (Lowenthal, 2010). But for this study, it is defined in the context of e-learning as the degree to which the participants online engagement creates the perception that the other person is physically present and real (Gunawardena & Zittle, 1997). Sociability is defined as "the ability to facilitate the emergence of a social space: the human network of social relationships between group members that is embedded in group structures of norms and values, rules and roles, beliefs, and ideals" (Kirschner et al., 2004, p. 60). SP is different from SOC in that SOC is the degree to which a system supports the interaction of the participants (Smith & Sivo, 2012). In order to gather results, a questionnaire, comprised of 41 multiple choice questions from existing instruments, was given to K-12 teachers participating in a statewide online reading course (Smith & Sivo, 2012). Results from this study found the PEU and PU are predictors of teachers' intentions to continue using online professional development, with PU being the stronger predictor of the two (Smith & Sivo, 2012). Participants perceptions of how useful the e-learning course was strongly influenced by their intentions to use e-learning for future professional development needs (Smith & Sivo, 2012). This is consistent with previous research findings in relation to usefulness and technology acceptance (Garet, Porter & Desimone, 2001; Holland, 2005; Schlager & Fusco, 2003). Results also concluded that SP and SOC are significant and suggest that these variables affect users perceived ease of use (Smith & Sivo, 2012). SOC had a statistically significant influence on PEU, which may have been a result of the technical support

and communication provided by the course facilitators on using the online course features within this study (Smith & Sivo, 2012). SP was found to have a weaker positive influence on PU, which was a surprise to researchers as teachers had been sharing with each other their use of professional development knowledge gained within their own classroom (Smith & Sivo, 2012). Therefore, based on the results, the three factors – PEU, PU, and SOC were found to be significant determinants of teachers' intent to continue using and meet their future professional development needs using e-learning platforms (Smith & Sivo, 2012).

UTAUT

This technology adoption model has been shown to outperform eight preceding models, explaining 70% of the variance in behavioural intention (Venkatesh et al., 2003) and 50% in technology use (Venkatesh et al., 2012). The UTAUT model builds on the facets of the TAM model by focusing on performance expectancy (PE), effort expectancy (EE), social influence (SI), and facilitating conditions (FC) (Venkatesh et al., 2003). PE is the extent to which people expect using technology can boost their job performance and EE is the apparent level of effort required to use technology. SI is the "degree to which an individual perceives that important others believe he or she should use the new system" (Venkatesh et al., 2003, p. 451) and FC is the "degree to which an individual believes there is sufficient organisational infrastructure, resources, technical infrastructure, and technical support to support the use of the technology" (Khlaif, 2018, p. 52). In addition to these, UTAUT consists of four moderators: gender, age, experience, and voluntariness to further enhance the predictive power of the model (Venkatesh et al., 2003). In recent years, Venkatesh has added three additional variables – hedonic motivation, price value, and habit to create the UTAUT2 model (2012). Hedonic motivation is defined as the "fun or pleasure derived from using a technology", price value is defined as "consumers'

cognitive trade-off between the perceived benefits of the applications and the monetary cost for using them", and habit is defined as "the extent to which people tend to perform behaviours automatically because of learning" (Limayem at el. 2007, p. 705). The UTAUT model has been very successful in the business sector, and is beginning to be explored as a possibility in education (Birch & Irvine, 2009).

Application of the UTAUT

In order to examine how UTAUT has been used to investigate technology integration in schools, I will look at the application of OER, LMS, and E-Learning in a few specific settings

Adoption of Tablets in the Classroom. Research has mentioned that mobile technology has potential for use in education because it has helped to make learning available anyplace at any time. This descriptive case study was carried out after one year of implementing a tablet project in five middle schools in Palestine. There were two sources of data collection in this study: teachers weekly lesson plans and individual interviews (Khlaif, 2018). Based on those sources of information, low EE was the strongest predictor of the behavioural intention to adopt and accept mobile technologies (Khlaif, 2018). In addition, PE was found to be positively associated with the intention to use mobile technologies in teaching (Khlaif, 2018). Both of these findings are congruent with previous studies on the topic (Celik & Yesilyurt, 2013; Wang, Wu, & Wang, 2009).

Adoption of ICT-based instruction in Secondary Classrooms. There has been much growth and advancement in the area of information and communication technologies (ICT) over the past 20 years, and many countries see great value in advancing ICT growth in the education sector as a valuable commodity that would better prepare their students for the future (J. Kim & Lee, 2020). As a result, it is important for teachers to know, understand, and apply ICT based

instruction in the classroom. The quantitative data collected from this study was through a questionnaire based on the studies conducted by Venkatesh et al. (2003). The questionnaire was completed by 305 secondary school teachers in the Philippines and revealed that PE, EE, SI, and educational policy (e.g. cultural, technical, political, and organizational issues including policies about implementation of ICT instruction) have significant effects on teachers behavioural intention to use ICT (J. Kim & Lee, 2020). This information is consistent with previous studies which highlight that PE is the most significant forecaster of behavioural intention for technology use because users look to the degree of benefit can be gained from using a new technology (Alotaibi & Wald, 2014; Dwivedi, et al., 2019). PE was important for this group of teachers as they receive an annual performance review from their administrator. Previous research also supports that EE is a very significant determinant because it aids in the process of assessing the extent to which effort is needed to learn and understand a particular technology (Magsamen-Conrad, et al., 2015; Oliveira, et al., 2016). This study showed that teachers behavioural intention, ICT use habits, and facilitating conditions (e.g. perception of being able to access required resources, as well as the ability to obtain knowledge and the necessary support needed to use ICT's for instruction) have positive effects on the actual use of ICT's for instruction (J. Kim & Lee, 2020).

Preservice Teachers ICT Integration and Adoption. ICT is becoming increasingly important in Canadian education which is evident through the British Columbia Ministry of Education integration throughout the new K-12 redesigned curriculum (British Columbia Ministry of Education, 2015) as well as initiatives in other provinces (e.g. Alberta Education, 2000; Ontario Ministry of Education, 2007). If the country values the integration of ICT in education, then it is important that new and upcoming teachers are comfortable and capable of

integrating it into students' educations (Birch & Irvine, 2009). This mixed-methods approach to the study combined both qualitative and quantitative data from pre-service teachers who were enrolled in a secondary education program at a mid-sized western Canadian university. The quantitative data was gathered through surveys throughout their courses and the qualitative data was gathered through follow up interviews. The study found that the only significant predictor of ICT use in pre-service teachers teaching was EE, and the only significant moderator was age (Birch & Irvine, 2009). As the data showed, intention to use ICT decreases as the participant age increases (Birch & Irvine, 2009). It is also important to note, that in this study, SI had the lowest correlation with BI (Birch & Irvine, 2009).

Implications for Technology Adoption in K-12

In all three areas of TAM research noted above, PU was found to be the primary predictor of teachers' intentions to adopt a new technology. Usefulness can be developed and understood in a variety of ways in regard to technology integration. Some suggestions that were made throughout the literature are: up to date resources and information (Kimmons, 2016), exposure and positive experiences engaging with the new technology (Tondeur et al., 2012), and teachers learning from and becoming role models to share information with others (Tang et al., 2020).

Through the use of the UTAUT model in K-12 education settings, research has found that PE and EE are surfacing as the most significant predictors of behavioural intention when adoption new technologies (Birch & Irvine, 2009; Khlaif, 2018; J. Kim & Lee, 2020). Therefore, policy makers and administrators should "create opportunities and trainings that expose teachers and familiarize them with the use of technology, in turn, to adopt it for the classroom instruction" (J. Kim & Lee, 2020, p. 11). This increases teachers EE because it has been shown that teachers

rate themselves on a scale based on what they are exposed to, not comparatively to the entire scope of ICT. Throughout the research, there are some suggestions on how to harness the facets of the UTAUT model to increase technology adoption among teachers. Some of these suggestions are: annual performance reports, access to additional and up-to-date resources, technical support and infrastructure, experience and exposure to a variety of technologies to create feelings of familiarity, mentors, social media groups, school policy, and teacher training (Khlaif, 2018). It is important that teachers see themselves as learners, see the importance of what they are doing, and are included as legitimate participants of the technology adoption process, and should be sought when making policy decisions on integration technology (Khlaif, 2018).

Psychological Constructs that Influence Adoption

Authentic Experiences and Exposure

Authentic learning experiences typically focus on "real-world, complex problems and their solutions, using role-playing exercises, problem-based activities, case studies, and participation in virtual communities of practice" (Lombardi, 2007, p. 2). These types of experiences are imperative to decrease anxiety and increase awareness and confidence in teachers (Theelen et al., 2020). This is state of mind is imperative when learning something new or transitioning through change. Therefore, there is huge importance in receiving and applying knowledge about educational technology in authentic way in schools (Tondeur et al., 2012).

It has been found in research, that teachers who viewed technology as merely "a way to keep kids busy," did not see the relevance of technology integration into the classroom (Hew & Brush, 2007, p. 229). In addition, it is important to provide hands-on experiences for learners as watching technology being used by a teacher or others does not substitute for doing (Tearle &

Golder, 2008). Often teachers do not see the value of technology integration until they have developed basic skills (Snoeyink & Ertmer, 2002). It is important, as school leaders, to help teachers to see a clear connection between the technology being used and subject content being taught (Hughes, 2005). The more "content specific the example, the more likely the teacher will see the value [of technology] and learn it" (Hughes, 2005, p. 296). Therefore, by providing authentic experiences and exposing teachers to new aspects of technology and how they could apply it to their teaching, would directly positively impact their perceived usefulness of the new technology tool or concept. The more confidence in technology and a more positive attitude increase the frequency of technology education, which consequently, increases teaching experience (Rohaan et al., 2010). This circle of positive reinforcement will contribute to the quality of technology education in primary schools (Rohaan et al., 2010).

Zone of Proximal Development

The Zone of Proximal Development (ZPD) is a way to explain how cognitive growth occurs in children. It was developed by Lev Semenovich Vygotsky during the late 1920's and elaborated on until his death in 1934 (Shabani et al., 2010). Originally, it was a way to understand children's' developmental level and what kind of tasks they could complete independently versus what they could do with someone else's assistance (Vygotsky et al., 1978). Vygotsky described it as 'the distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem solving under guidance or in collaboration with more capable peers" (1978, p. 86). This guidance can also be provided by a teacher and has been referred to as scaffolding in later literature.

Recently, Warford (2011) has done research into how to apply the ZPD theory to teachers. Through his study, he found that teachers moved through four stages: Self-Assistance, Teacher Assistance, Internalization, and Recurrence as seen in Figure 3 (Warford, 2011).

Figure 3

Warford's Zone of Proximal Teacher Development (ZPTD) (2011). From Warford, M.K. (2011). The Zone of Proximal Teacher Development. Teaching and Teacher Education, 27(2), 252-258

ZPTD	Sample Interventionist DA	Sample Interactionist DA
I. Self-assistance [Stage II in ZPD (Gallimore & Tharp, 1990)]	Preparing learning autobiographies, Responding to prompts about prior experiences	Discussion, sharing autobiographies, follow-up questions
II. Expert other assistance [Stage I in ZPD) (Gallimore & Tharp, 1990)]	Analysis of teaching practices (demos., videos, field observation) Role-taking/playing Forced choice quizzes (written) WebQuests Cubing exercises	Leading questions and follow-up discussion. Processing role plays Oral quizzes
III. Internalization (automatization)	Journaling Micro-teaching Candidate statement of teaching philosophy	Discussion, dialogic partners
IV. Recursion (De-automatization)	Journaling Clinical reflective reports: collecting information and making warranted claims for change On-line forum Role taking/playing	Discussion, sharing autobiographies, follow-up questions, post-observation conferencing. Processing role-plays.

Throughout the stages, there were certain factors that affected the ZPD. These included peers and mentors, contextual constraints such as policy decisions, personal choice, and resources (Shabani et al., 2010). This supports previous research in the understanding that "although teachers express considerable interest in learning how to use technology, they need consistent support and extensive training in order to consider themselves able for integrating it into their instructional practice" (Demetriadis et al., 2003, p. 19). Therefore, when leaders are planning for technology integration, it is important to include resources, peer support, and mentors in order to increase teachers zones of proximal development, which in turn should decrease their levels of expected effort.

Leadership Characteristics

Over time, literature has moved away from the 'command and control' view of leadership, to a 'cultivate and coordinate' perspective. This approach helps to build competencies and success without being constantly 'in charge.' Previous to this, change has happened in isolation where administration has had little insight into what was going on. Now, we are part of a culture of information where there is a desperate need for collaborative approaches to teaching and learning (Law et al., 2011). Learning is a process of social interaction that takes place when individuals share ideas, share experiences, and are willing to critically reflect on their own thoughts, beliefs, and values. Therefore, providing the opportunities for collaboration on the topic of technology and supporting staff to take on leadership roles with technology implementation is key. Here, it is important to note that the key to ongoing effective collaboration is trust. Hoy and Tschannen-Moran (1999) suggest five facets of trust that are necessary for educational leaders to build successful schools: benevolence, honesty, openness, reliability, and competence (p. 184).

In addition, learning and leading can be emotionally and intellectually demanding. Sharing the load and working together provides built-in support though the process. This approach to leading has been given many names such as lateral capacity building, multilevel leadership, or distributed leadership and it can be done by establishing special interest groups across classrooms, schools, and districts (Law et al., 2011). Distributed leadership "assumes a set of direction-setting and influence practices potentially enacted by people at all levels rather than a set of characteristics and attributes located in people at the top" (Fletcher & Kaufer, 2003, p. 22). In order to empower faculty, staff, students, parents, and community members, a stakeholder-based approach to decision making should be used as much as possible (Raish et al.,

2018). These distributed leadership qualities are important in affecting teachers social influence and level of confidence when trying something new.

Social Media

Increased accessibility as well as proliferation of online resources has led teachers to go online to connect, share ideas, and expand their professional learning on social media platforms (Prestridge, 2019). The one-size-fits-all approach dictated by schools and districts it no longer applicable as there are so many alternatives. Sites such as Facebook, Instagram, Pinterest, Teacherspayteachers, Twitter, and Google Plus have proved helpful and useful for educators (Prestridge, 2019). One of the main functions of these online environments is the opportunity for teachers to connect with like-minded individuals. These expansive social networks are called Personal Learning Networks (PLN) and are described as "a system of interpersonal connections and resources" that can be used for informal learning, collaboration, and exchanging knowledge and ideas (Trust, 2012, p. 133). Through research into teachers use of technology, four categories of engagement online emerged: info-consumer, info-networker, self-seeking contributor, and vocationalist (Prestridge, 2019). The info-consumer seeks to find and take away new knowledge or ideas and resources from these social media platforms (Prestridge, 2019). The intention for this type of user is self-driven and the focus is to consume content. The info-networker seeks to find and take away new ideas and resources from social media spaces for the purpose of sharing with others (Prestridge, 2019). The intention for this type of user is for the content needs of others. They often know the 'who's who' of topical fields but do not have a specific subject or concept focus. The self-seeking contributor posts their knowledge, ideas, and/or curriculum materials to social media sites to engage with their PLN (Prestridge, 2019). The engagement with others is for self-determining reasons such as getting specific feedback, validation, to ask

questions, or acquire more information. The vocationalist engages in social media as a professional learning process to build the profession and contributes to the growing body of knowledge (Prestridge, 2019). Research has identified that "teachers acknowledge their learning through social media as valuable, informal, and self-directed, providing selective opportunities to impact on their classroom practices" (Prestridge, 2019, p. 155). Therefore, technology leaders need to support teachers in their development of their PLN and challenge them to engage with those networks in a variety of different ways to build their understanding. This support should affect their social influence factors referenced in TAM and UTAUT.

Parent Pressures

A study of German teachers (Stoeber & Rennert, 2008) found that pressure and demands from parents positively predicted teacher burnout. The relationship between teacher and parent can be a challenging relationship to navigate. Experiencing distrust, or difficulty in cooperation may be a serious strain on teachers – with a negative impact on burnout (Skaalvik & Skaalvik, 2009). It is a relationship that is not often an equal partnership with teachers as the 'expert' delivering information whereas parents usually adopt a more passive supporting role (Bilton et al., 2018). It is recommended that schools consult with parent and community groups on a regular and frequent basis in order to foster more trusting/collaborative relationships (Bilton et al., 2018). This will help schools to reach common goals more efficiently and effectively as well as build the capability for another avenue of positive social influence.

School Cultures

School culture is defined as a "collection of traditions and rituals that have been built up over time as teachers, students, parents, and administrators work together and deal with crises and accomplishments" (Deal & Peterson, 1999, p. 4). They are influential and shape and re-

shape what people do, think and feel (Beaudoin & Taylor, 2004; Cooper, 1988; Craig, 2009; Deal & Peterson, 1999, 2009; Guise, 2009; Hongboontri, 2003; Hongboontri & Chaokongjakra, 2011; Jurasaite-Harbinson & Rex, 2010; Kleinsasser, 1993, 2013; Lieberman, 1988, 1990; Maslowski, 2001; McLaughlin, 1993; Muhammad, 2009; Rosenholtz, 1991; Sato & Kleinsasser, 2004; Schien, 2010). Through research it has been found that school culture is among the most important factors with impact on teacher empowerment (Balkar, 2015). In order for teachers to be more willing to change and try new things, they need to feel empowered to do so. The common characteristics of empowered school culture are teacher efficacy, job satisfaction, strong social relationships, and leadership of the school administration (Balkar, 2015). Empowering school cultures emphasize a sense of confidence, change, innovation, and collaborative management for all staff involved (Balkar, 2015). As a school leader, it is imperative to create an empowering school culture in order for teachers to feel ready and able to for change, especially in the field of educational technology, where there are varying levels of comfort, confidence, and buy-in.

Chapter 3: School Technology Plan Template

Throughout my research, I have found that there are many factors, both individual and systemic, that influence teachers' propensity to change. In order to plan for effective and sustained change within educational technology, it is important for leaders to consider how teachers see how new technology can be useful and support what they are already doing in the classroom, boost their performance, and not expect high levels of effort to engage in. However, I have noticed gaps in the research on how to apply these findings in a cohesive and concrete way to affect system wide change within a district or school.

Therefore, I am going to take all the information and considerations mentioned in the above literature and apply it to a structured process and plan. When changing or shifting ideas – whether in scientific research or in writing, it is important to make a plan. I will create a targeted template that school technology leaders can use as a roadmap to move towards empowered change.

Technology Plans in K-12 Context

As it has previously been mentioned in my research, technology cannot be an add on, but must be fully incorporated into the educational process and should consider components at both a system and an individual level. However, a significant issue that often impedes the implementation of successfully technology programs is a lack of appropriate planning (Picciano, 2011). At an individual level, Keith Rispin (2015) has come up with four pillars of a technology implementation plan for K-12 educators – leadership, teachers, curriculum and resources, and professional development. He notes that "these pillars represent the essential change knowledge needed to successfully implement technology into the classroom" (Rispin, 2015, p. 33).

However, when considering technology implementation at a school or district level, there are some additional considerations that have to be made by leaders. This requires the development and implementation of a comprehensive plan to see where the school and district currently stands in terms of technology, where it would like to be in the future, and how the school and district anticipates getting there (Chapman, 2013). A five-step approach can be used for developing a technology plan – pre-planning (establishing the group and creating a mission/vision), analysis of the current system, construction of the actual plan (formulation of the plan and developing professional development and technical support plans), writing the technology plan document (implementing the curriculum, setting timelines, scheduling professional development, monitoring overall progress), assessment, monitoring, maintenance, and revision of the technology plan (National Center for Technology Planning, 2010). This is a continual process that needs to be comprehensive, collaborative, committed, and continual (Picciano, 2011).

Technology Plan Examples

First, I started by looking at examples of technology plans from public school districts across British Columbia. I then compared and contrasted the plans to identify aspects that made them successful in my view.

The Sea to Sky School District Technology Plan (2019) clearly recognizes the teachers and staff that were part of the planning committee. It is important when designing a successful technology plan, that there are a variety of stakeholders involved in the process. This allows for different perspectives to be shared as well as input from all aspects of the learning community – ideally ensuring school-wide buy in. They also used infographics to demonstrate how concepts that may be difficult to understand, like technology infrastructure, work together to support

teacher and student learning. In addition, the Sea to Sky District included timelines and checklists alongside their goals in order to clearly communicate the steps required to reach the goal.

The Sunshine Coast School District Technology Plan (2018) included a detailed Staff Technology Survey which helped to guide where the strengths were and areas that need improvement or of further interest. A survey like this could provide crucial information from school staff that might not get shared at a large meeting and can provide an overall idea of the staffs' level of comfort and experience with technology. They also included information about district infrastructure and process for technology updates which is important information for educators to know and understand at a school level.

The Cowichan Valley School District Technology Plan (2020) grounded their understanding of technology integration of the International Standards for Technology in Education (ISTE) for Educators (2008). Their goals were directly linked to the specific outcomes for teachers in that document. They also broke down the district wide goals into different sections in order to make it clearer and more attainable. Some of those sections were strategies, actions, measurement, and reporting. They also included an area for evidence of success. This section details the data collected, the instrument used to collect the data, and frequency of data collection.

The Greater Victoria School District Technology Plan (2017) has a definite and clear process for each goal. It has broken down each section into goal, timeline, resources needed, reporting, evidence and targets, and outcomes. The details they included in each section was clear and concise and was easy to read.

The North Okanagan-Shuswap School District Technology Plan (2019) was increasingly clear and concise. It used language that was easy to understand and did not include technology jargon which makes it accessible for all stakeholders involved in the planning process.

From what I could gather from my searches online, there are few K-12 schools in British Columbia that have published Technology Plans. Many have District Technology Plans, but there is a lack of clarity on school-level technology plans and processes. Therefore, I decided to create a technology plan template that takes into consideration aspects needed to create fundamental change within educational technology. I thought this might be helpful for school leaders in K-12 schools in implementing sustained and effective change.

The Technology Plan Template

The document that I created is meant to be used by school-based technology committees to create a vision for change. The sections are to be filled out with the school team as they progress through the planning process. The 'questions to consider' columns provide prompts to help design a process that is thoughtful and inclusive for that specific school site. These questions link to key factors of change theory as well as technology adoption theories.

The first section of the document is a mission/vision statement (see Figure 4). This is for the purpose of identifying common understanding and core values of the team. As mentioned, this should be done with the whole technology committee in order to gain insight from a variety of perspectives and for members to develop an understanding of the purpose. This section could easily connect to a mission statement the school/district already have or could link to the districts strategic plan.

Figure 4

Mission/Vision Statement Section of the Technology Plan Template

MISSION/VISION STATEMENT A mission statement defines your school's goals and objectives and its approach to reach those objectives. A vision statement describes the desired future position of the school.	
	Questions to consider: - *Does your school/district already have a mission or vision statement?* - *Does your district have a strategic plan? How does this connect to it?* - *What motivates your staff to embrace change?*

The second section of the document is a space to acknowledge the technology plan committee members (see Figure 5). This helps to build shared leadership and develop a cohesive school culture by including all stakeholders. When planning for technology committee meetings it is important to consider when and where the meetings will be held in order to ensure everyone who is interested can join. Within this section I also included 'questions to consider' that could impact staff members effort expectancy. Having a technology committee section in a monthly staff meeting could decrease staffs' effort expectancy. However, inviting families in (virtually or in person) at that time could prove difficult and disruptive. It is important for leaders to thoughtfully plan out and be intentional with their meeting and planning times.

Figure 5

Committee Members Section of the Technology Plan Template

TECHNOLOGY PLAN COMMITTEE MEMBERS The following people are acknowledged for their time, thoughtful contributions, and commitment to this learning.	
	Questions to consider: - *When/where will these meetings be held so that its available to all? (e.g., before school, after school, staff meetings, virtual/in person, etc.)* - *How often will these meetings be held? How much additional effort is expected from staff?* - *Is it mandatory or optional for staff?* - *How to provide a space for safe conversation where people feel heard and valued?* - *Have you included all stakeholders (e.g., teachers, educational assistants, students, parents, school trustee, district administrator, community members, etc.)?* - *How is this information being communicated/shared out?*

The third section of this document is guiding principles (see Figure 6). The International Society of Technology in Education (ISTE) Standards (2008) are international technology integration standards for leaders, educators, and students. They provide a guideline for learning. With these documents, school teams can identify where they feel successful and areas where they require further support and/or learning. It will ground them to a framework for growth and learning.

Figure 6

Guiding Principles Section of the Technology Plan Template

GUIDING PRINCIPLES – International Society for Technology in Education (ISTE) Standards These standards are a road map to helping students become empowered learners. They will deepen educators' practices, promote collaboration, and challenge them to re-think traditional approaches.	
	Questions to consider: - *How can the ISTE Standards For Educators be used as a guide?* - *Where are you seeing examples of this already?* - *What are you trying to accomplish?* - *If working in BC – can link to BC Digital Literacy Framework?*

The fourth section of this document is a needs assessment and analysis (see Figure 7). In order for the committee to decide on goals for the school community, there needs to be a collective understanding of the general feelings around technology. This can be done in many ways - from interviews, questionnaires, observations, to focus groups. I have included some questionnaire and survey examples if teams are not sure where to start. The important thing is that the team is collecting data and making decisions based on the results.

The fifth section of this document is district and school infrastructure (see Figure 8). In order for the school-based team to make decisions, there needs to be a general understanding of how things work at a district level with the technology infrastructure. This includes everything from internet speed, bandwidth, to device ratios, and district maintenance and upgrades. With a better understanding of how things work at an operational level, school teams are able to plan and prepare more effectively. Outlining this information for all staff might also decrease effort expectancy as the processes and procedures are clearly laid out.

Figure 7

Needs Assessment and Analysis Section of the Technology Plan Template

NEEDS ASSESSMENT AND ANALYSIS Overall feeling from teachers and other stakeholders about educational technology in the school currently.	
Samples: The Organizational Climate Questionnaire (OCDQ-RE) Denison Organizational Culture Survey (sample report) Staff Technology Survey by Emily Miller (Google Forms) Family & Community Members Technology Survey by Emily Miller (Google Forms)	**Questions to consider:** - *Which different stakeholder groups need to be targeted with a need's assessment?* - *What is the best way to do this? (e.g., survey, interview, informal and formal observations, focus groups, etc.)* - *What does the data show?*

Figure 8

A Portion of the District and School Infrastructure Section of the Technology Plan Template

DISTRICT AND SCHOOL INFRASTRUCTURE There are many things that need to be in place in order for a school to run a successful technology program. Outline your district and school's infrastructure.	
	Questions to consider: - *What is the internet bandwidth in your building(s)?* - *What is your device to teacher and device to student ratio?* - *What district digital resources do you have access to? Are there guidelines?* - *What is the district and school protocol for device maintenance and upgrades?* - *What is the structure of support within the school/district?* - *Is there a student support team?*

The sixth section of this document is the plan and procedure (see Figure 9). This is where the school goals will be clearly laid out. For each goal there needs to be a timeline, plan for evidence collecting, resources to support, and identifiable outcomes. Within this section, it is important for school teams to consider ways in which they can provide opportunities for developing collective knowledge and authentically building capacities. However they plan to do so should address staffs perceived ease of use and perceived usefulness. This could be through the sharing of digital resources, connecting with district experts, engaging in professional development, developing a mentorship program, observing colleagues, opportunities to co-teach, or developing personal learning networks (PLN) on social media. In addition, it is important in this step to plan for how data will be gathered and tracked. This is essential for reflective action and ensuring that the technology plan is effective.

Figure 9

Plan and Procedure Section of the Technology Plan Template

PLAN AND PROCEDURE
In the tables below, list your school goals and specific information about how your school can achieve those goals

<table>
<tr><td>Goal #1:</td><td>Timeline:</td><td rowspan="3">Questions to consider:
- How could this connect to the District Strategic Plan?
- How do you address perceptions of ease of use and usefulness when it comes to new technology?
- How to encourage innovation?
- What are the expectations of teachers in their use of technology?
- How to make the learning an authentic, hands-on, and a worthwhile experience?
- How to develop opportunities for capacity building for staff – small and large group?
- How to plan for a variety of learning experiences – formal and informal?
- Who will be providing those learning experiences? (e.g. district experts, colleagues, teacher in another school, observations, co-teaching, mentor, etc.)
- Who is going to be collecting the evidence?
- How do you track progress?
- How often do you build in reflective action to review the goals and progress?
- Is the timeline realistic?</td></tr>
<tr><td>Evidence:</td><td>Resources Needed:</td></tr>
<tr><td colspan="2">Outcome(s):</td></tr>
</table>

The seventh and final section of this document is community resources and support (see Figure 10). Sometimes school goals have components that require additional funding (e.g. more devices, apps, guest speakers, etc.). Depending on the geographical region and demographic of a school, financial opportunities may be limited. There are plenty of ways to engage with the school community. Some options I have listed are school Parent Advisory Council's (PAC) and local businesses. PAC's sometimes have technology funds for device replacement and some businesses offer technology grants, donate old technology, or could collect donations from customers to support the school plan. In addition, I created a Technology Grant Application Form Template to help teams request and advocate for support. Having a specific and strategic plan will help communicate to community members about how they can support and help the school reach the outlined goals.

Figure 10

Community Resources and Support Section of the Technology Plan Template

COMMUNITY RESOURCES AND SUPPORT There are many ways to get technical and financial aid to support the success of a technology plan. Do some research into how the surrounding community can help support your specific school goals.	
	Questions to consider: - *What is the process for requesting funding from the School District?* - *How can your PAC help support your technology plan?* - *Are there any businesses in your community…* o *that offer technology grants?* o *that are donating old technology?* o *That can collect donations to support a technology fund?* *If needed, use this Technology Grant Application Template to request district or community funding support. Please make a copy and customize as needed.*

There are two complete document versions available for reference and linked on my personal blog site.

- Technology Plan Template Document (Editable) – Click here for an editable version of the technology plan template
- Technology Plan Template Document (PDF) – Click here for a static version of the technology plan template
- Technology Grant Funding Application Document – Click here for an editable version of the technology plan template *make a copy*
- Technology Grant Funding Application Document – Click here for a static version of the technology plan template

How to Use

This document is meant for schools to reference and use as they navigate and plan for technology use and implementation. With the Creative Commons License, Attribution 4.0 International, you are free to:

Share – copy and redistribute the material in any medium or format

Adapt – remix, transform, and build upon the material for any purpose, even commercially

I hope for this to be a living document. As I work through this with my own staff, I will update and change it to reflect what worked for us. In addition, I hope to engage schools across the country to use this document as a place to start with planning for technology change.

If you want to share out your experience with the document or ask questions, please reach out on social media (@MsEmilyMiller on Instagram and Twitter) or use the #techplanteam hashtag on Twitter.

Chapter 4: Conclusion

This project has been a personal journey for me. I applied to this Masters of Education (M.Ed) program at the same time I applied for a Vice Principal position and got accepted to both. I have been learning to navigate the role of school administrator, teacher, and researcher – all during a global pandemic. Honestly, I knew I was not going to have the time and capacity for a large and outside of the box research exploration. I wanted and desperately needed my research and M.Ed thesis to be connected to issues I was seeing and experiencing in my role as teacher and school administrator. I wanted to find a way to grow my own knowledge and skills and support others around me.

Summary of learning

Coming into this M.Ed program, I had no idea what I wanted to focus on for my thesis, but I knew that I needed it to be connected to technology leadership. First, I wanted to know what makes an effective technology leader – which I explored in a literature review assignment for EDCI 569. This was interesting information to learn, but it was fairly general and vague, in my opinion. For example, I learned about distributed leadership and the importance of collaborating in order to lead empowered change (Law et al., 2011). I also learned about the development of 21st century skills such as innovation, critical thinking, information literacy, and flexibility (Schleicher, 2011). I also explored the importance of pedagogical understanding and alignment between leaders and staff in order to build a more critical and thoughtful team (Koehler & Mishra, 2009). Within this research, I also explored key factors for sustainability of technology in education such as the TPACK model (Koehler & Mishra, 2009) and measuring standards such as the TAM (Davis, 1989) and International Society of Technology in Education (2008). However, I felt I needed to go deeper and find a way that I could find and share

information in a clear and concise way to help school leaders like myself support teachers to embrace effective and sustained change in regard to technology

From there I started looking at important facets of fundamental change in the field of educational technology – change theory and technology adoption theories. I wanted to compare and contrast the aspects and pull-out overlapping themes. However, as I continued to delve deeper, I realized that they did not overlap very much. Instead, they were components of change at two different levels – system and individual. That got me thinking, that I needed to tease out all the important components in each and create something for school leaders – to help them think through, plan, and support staff through a process of change within educational technology at their school sites. In my school specifically, there has been high administrator turnover in the last five years. Therefore, in many aspects, including technology education, there has been little discussion and whole school direction and planning. I was keen to find a way to guide my teaching and leading approach with research.

Guiding Questions from Research to Application

Throughout my research, I continued to come up against the idea that school leadership play an important role in reform of technology, but there seemed to be very little specific examples of how to do so. Questions kept coming up for me on how to apply the information I was reading into a context that would make sense for other technology leaders. For example, if ensuring that staff understand how a new technology tool or application could be useful and enhance what teachers are already doing or make their jobs easier – what is out there that can support educational leaders to include that in their thoughts and planning process? If motivation is an important component that drives change – how can leaders, ensure that the way they are planning to introduce a new technology creates sustained motivation for their specific group of

educators? Knowing all this information is one thing, but how can it be applied it in a way that is not overwhelming and that prompts leaders to consider how they are planning for sustained change?

From experience over the last few years, I know and understand that every day is busy, and it can sometimes be extremely hard to plan strategically. I wanted to create something that took elements of research and formatted it in a way that would be clear to anybody using it. This template creates a foundation to start with and use researched-based approaches and components to help guide a path towards sustained and effective change.

Reflections on Growth

My growth on this topic over the last two years has been immense. I have been learning and researching and shifting my practice as I have been learning more. I came into this program with confidence about my use and level of comfort with technology and that has not changed much. What has changed drastically is my understanding of leading in the field of technology - to be innovative, to be flexible, to be understanding, and do so with purpose and intention.

As I went deeper and started researching about technology change in schools, I was learning how to plan and questions to ask myself in order to engage the staff in change. Through this research I quickly learned that these key facets for change not only apply to technology but other areas of change. I now have ‘questions to consider’ frequently going through my head as I help plan for our Framework for Enhancing student learning process in my school district, work with our school based Indigenous Education Committee, and help to plan/prepare professional development. Some of these questions include:

- Have we engaged all stakeholders in this planning process?
- How/when do we hold meetings in order to provide opportunities for all?

- How can we ensure that the effort expectancy for staff is low?
- How accessible are the professional development opportunities?
- Are we providing opportunities for staff to develop their virtual and in-person PLN (social media, guest speakers, etc.)?
- How are we harnessing the experience of staff members? Who is doing the sharing of information?
- How are we honouring the learning that is going on?
- How can we track our progress?

I hope this project helps educational leaders and their teams to plan for effective change. This document can be used as a guide but can also be changed and formatted to fit the user group. This is not a static document but something that can morph and change depending on who is using it, what they are using it for, and what their needs are. The document contains the bare bones to support and plan. I hope to alter and change the document as I use it in my practice as well as receive feedback from others who use it. I am excited to put this plan into practice next year with my school staff and see how I can refine it even more.

Recommendations for Future Research

The first recommendation I have is for more research to be done on the development and implementation of technology plans at the K-12 level and how components can be refined in order to support effective change and develop best practices. There seems to be substantial research in the field on components of effective change (e.g., motivation, usefulness, ease of use) for specific types of technology in specific settings – however, there does not seem to be as much research applying those considerations into general technology planning at a school level. This could allow for areas to be reviewed and refined in order to better meet team's needs.

The second recommendation I have is for each school district to have an up-to-date technology plan and working to have each school within that district have their own site-specific plan. In my online searches for this project, there were only a handful of British Columbia School Districts that had current and updated plans and very few K-12 public schools that had a posted and up-to-date technology plan. Having an up-to-date district plan allows schools to have an understanding of what the district values and is focusing their finances and resources on. School sites would then be more able to make specific goals aligned with district vision while continuing to support their community of teachers and learners. In addition, they could provide useful data to school districts about where schools are needing support.

I think that if technology is an important part of our world and something that we think is important to engage in and teach students how to engage with – that we need to have specific and strategic plans and supports in place for people at all levels of education.

References

Adams, D. A., Nelson, R. R., & Todd, P. A. (1992). Perceived Usefulness, Ease of Use, and Usage of Information Technology: A Replication. *MIS Quarterly*, 16(2), 227–247. https://doi.org/10.2307/249577

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50, 179–211.

Alberta Education. (2000). Information and Communication Technologies K-12 [Program of studies]. https://education.alberta.ca/media/3069586/m_12.pdf

Alotaibi, S.J., & Wald, M. (2014). Discussion and evaluation of the updated UTAUT model in IAMSs. *International Journal of Intelligent Computing Research (IJICR)*, 5(1/2), 1-10

Balkar, B. (2015). Defining an empowering school culture (ESC): Teacher perceptions. *Issues in Educational Research*, 25(3), 205-225

Beaudoin, M. & Taylor, M. E. (2004). *Creating a positive school culture: How principals and teachers can solve problems together*. Corwin Press.

Beedle, J., & Wang, S. (2013). Roles of a Technology Leader. In Wang, S., & Hartsell, T. (Ed.), *Technology Integration and Foundations for Effective Leadership* (pp. 228-241). IGI Global. http://doi:10.4018/978-1-4666-2656-0.ch013

Beller, M. (2012). Technologies in large-scale assessments: New directions, challenges, and opportunities, 25-45. Springer Netherlands. https://doi.org/10/1007/978-94-007-4629-9_3

Bilton, R., Jackson, A., & Hymer, B. (2018). Cooperation, conflict and control: Parent–teacher relationships in an English secondary school. *Educational Review*, 70(4), 510–526. https://doi.org/10.1080/00131911.2017.1410107

Birch, A., & Irvine, V. (2009). Preservice teachers' acceptance of ICT integration in the classroom: Applying the UTAUT model. *Educational Media International*, 46(4), 295–315. https://doi.org/10.1080/09523980903387506

British Columbia Ministry of Education. (2013) Digital Literacy Framework. https://www2.gov.bc.ca/assets/gov/education/kindergarten-to-grade-12/teach/teaching-tools/digital-literacy-framework.pdf

British Columbia Ministry of Education. (2015). Redesigned Curriculum. https://curriculum.gov.bc.ca/

British Columbia Ministry of Education. (2018). Applied Design, Skills, and Technology Curriculum [Curriculum Document]. https://curriculum.gov.bc.ca/sites/curriculum.gov.bc.ca/files/curriculum/adst/en_adst_k-9_elab.pdf

Celik, V., & Yesilyurt, E. (2013). Attitudes to technology, perceived computer self-efficacy and computer anxiety as predictors of computer supported education. *Computers & Education*, 60(1), 148-158

Chapman, D. L. (2013). Overview of Technology Plans. In Wang, S., & Hartsell, T. (Eds.), *Technology Integration and Foundations for Effective Leadership*, 71-87. IGI Global. http://doi:10.4018/978-1-4666-2656-0.ch005

Cooper, M. (1988). Whose culture is it, anyway? In A. Lieberman (ed.), *Building a professional culture in schools* (pp. 45-54). Teachers College Press

Cowichan Valley School District. (2020). *Learn Cowichan Instructional Technology and Innovation Plan (2020-2024)*. Retrieved from: https://sd79.bc.ca/wp-content/uploads/Tech-Plan-2020-2024.pdf

Craig, C. J. (2009). Research in the midst of organized school reform: Versions of teacher community in tension. *American Educational Research Journal*, 46(2), 598-619. http://dx.doi.org/10.3102/0002831208330213

Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly*, 13(3), 319–340. https://doi.org/10.2307/249008

Davis, F.D. & Venkatesh, V. (2004). Toward preprototype user acceptance testing of new information systems: Implications for software project management, in *IEEE Transactions on Engineering Management*, 51(1), 31-46, doi:10.1109/TEM.2003.822468

Deal, T.E., & Peterson, K.D. (1999). *Shaping school culture: The heart of leadership* (1st ed.). Jossey-Bass Publishers

Deal, T. E. & Peterson, K. D. (2009). *Shaping school cultures: Pitfalls, paradoxes, and promises*. Jossey-Bass Publishers.

Demetriadis, S., Barbas, A., Molohides, A., Palaigeorgiou, G., Psillos, D., Vlahavas, I., Tsoukalas, I., & Pombortsis, A. (2003). "Cultures in negotiation": Teachers' acceptance/resistance attitudes considering the infusion of technology into schools. *Computers & Education*, 41(1), 19–37. https://doi.org/10.1016/S0360-1315(03)00012-5

Dewey, J. (2016). 3 John Dewey. *Toward a Pragmatist Metaethics*, 54.

Durak, G. (2018). Open and Distance Learning Administration: The Organizational Models, Cultures, and Structure and the Barriers and Trends in ODL Administration. In K. Buyuk, S. Kocdar, & A. Bozkurt (Eds.), *Administrative Leadership in Open and Distance Learning Programs*, 84-116. IGI Global. doi:10.4018/978-1-5225-2645-2.ch004

Dwivedi, Y.K., Rana, N.P., Jeyaraj, A., Clement, M., & Williams, M.D. (2019). Re-examining the unified theory of acceptance and use of technology (UTAUT): Towards a revised theoretical model. *Information Systems Frontiers*, 21(3), 719-734

Elmore, R. F. (2004). *School reform from the inside out: Policy, practice, and performance*. Harvard University Press.

Fishbein, M. (1967). Attitudes and the prediction of behaviour. In M. Fishbein (Ed.), *Readings in attitude theory and measurement*. Wiley.

Fletcher, J., & Kaufer, K. (2003). Shared leadership: paradox and possibility. In C.L. Pearce, & J.A. Conger (Eds.), *Shared leadership: Reframing the hows and whys of leadership*, 21-47. SAGE Publications, Inc., https://www-doi-org.ezproxy.library.uvic.ca/10.4135/9781452229539.n2

Franciosi, S. J. (2012). Transformational leadership for education in a digital culture. *Digital Culture and Education*, *4*(2), 235–247.

Fullan, M. (2001). *The new meaning of educational change* (3rd,Revis ed.). Taylor & Francis Group. https://doi.org/10.4324/9780203986561

Fullan, M. (2007). Change Theory as a Force for School Improvement. In J. M. Burger, C. F. Webber, & P. Klinck (Eds.), *Intelligent Leadership: Constructs for Thinking Education Leaders*, 27–39. Springer Netherlands. https://doi.org/10.1007/978-1-4020-6022-9_3

Fullan, M. (2010;2012;). *All systems go: The change imperative for whole system reform*. Corwin.

Fullan, M. (2014). *The principal: Three keys to maximizing impact / michael fullan* (First ed.). Jossey-Bass.

Fullan, M. (2018). *Surreal change: The real life of transforming public education*. Routledge.

Fullan, M. (2020). *Leading in a culture of change* (Second). Jossey-Bass.

Garet, M.S., Porter, A.C., & Desimone, L. (2001). What makes professional development effective? Research from a national sample of teachers. *American Educational Research Journal*, 38, 915-945

Gil-Flores, J., Rodríguez-Santero, J., & Torres-Gordillo, J. (2017). Factors that explain the use of ICT in secondary-education classrooms: The role of teacher characteristics and school infrastructure. *Computers in Human Behavior*, 68, 441-449. https://doi.org/10.1016/j.chb.2016.11.057

Greater Victoria School District 61. (2017). *Technology for Learning Plan*. Retrieved from: https://www.sd61.bc.ca/wp-content/uploads/sites/91/2018/03/Technology-For-Learning-Plan.pdf

Guise, M. E. (2009). How three English language arts teachers negotiate their beliefs and instructional practices in three educational contexts. *Unpublished doctoral dissertation*.

Gunawardena, C & Zittle, F. (1997). Social presence as a predictor of satisfaction within a computer-mediated conferencing environment. *The American Journal of Distance Education*, 11, 8-26

Hall, G.E. (1979). The concerns-based approach to facilitating change. *Educational Horizons*, 57, 202-208

Heifetz, R., & Linsky, M. (2017). *Leadership on the Line, With a New Preface: Staying Alive Through the Dangers of Change*. Harvard Business Press.

Hew, K. F., & Brush, T. (2007). Integrating Technology into K-12 Teaching and Learning: Current Knowledge Gaps and Recommendations for Future Research. *Educational Technology Research and Development*, *55*(3), 223–252.

Holland, H. (2005). Teaching teachers: professional development to improve student achievement. *Research Points*, 3, 1-4.

Hoy, W. K., & Tschannen-Moran, M. (1999). The five faces of trust: An empirical confirmation in urban elementary schools. *Journal of School Leadership*, 9, 184–208.

Hongboontri, C. (2003). EFL university teachers in Thailand: Reviewing their perceptions and environment. *Unpublished doctoral dissertation*.

Hongboontri, C. & Chaokongjakra, W. (2011). The reciprocal relationship between school culture and foreign language teachers beliefs, behaviors, and instructional practices. *Thoughts*, 74-85.

Hughes, J. (2005). The role of teacher knowledge and learning experiences in forming technology-integrated pedagogy. *Journal of Technology and Teacher Education*, 13(2), 277

International Society for Technology in Education. (2008). *National educational technology standards for teachers.* Retrieved from http://www.iste.org/Content/NavigationMenu/NETS/ForTeachers/NETS_for_T

Jung, I., & Lee, J. (2020). A cross-cultural approach to the adoption of open educational resources in higher education. *British Journal of Educational Technology*, 51(1), 263– 280.

Jurasaite-Harbinson, E. & Rex, L. A. (2010). School cultures as contexts for informal teacher learning. *Teaching and Teacher Education*, 26(1), 267-277. http://dx.doi.org/10.1016/j.tate.2009.03.012

Kelly, H. (2014). A path analysis of educator perceptions of open educational resources using the technology acceptance model. *The International Review of Research in Open and Distributed Learning*, 15(2), 26– 42. https://doi.org.ezproxy.library.uvic.ca/10.19173/irrodl.v15i2.1715

Khlaif, Z. (2018). Teachers' Perceptions of Factors Affecting Their Adoption and Acceptance of Mobile Technology in K-12 Settings. *Computers in the Schools*, 35(1), 49–67. https://doi.org/10.1080/07380569.2018.1428001

Kim, B. W., Lee, W. G., Lee, B. R., & Shon, J. G. (2015). Influencing factors in OER usage of adult learners in Korea. *International Review of Research in Open and Distributed Learning*, 16(2), 1– 17.

Kimmons, R. (2016). Expansive openness in teacher practice. *Teachers College Record*, 118(9), 9.

Kirschner, P., Strijbos, J., Kreijns, K., & Beers, P.J. (2004). Designing electronic collaborative learning enviornments. *Educational Technology Research and Development*, 52(3), 47-66. https://doi.org/10.1007/BF02504675

Kim, C., & Baylor, A. L. (2008). A Virtual Change Agent: Motivating Pre-service Teachers to Integrate Technology in Their Future Classrooms. *Journal of Educational Technology & Society; Palmerston North*, *11*(2), 309–321.

Kim, J., & Lee, K. S.-S. (2020). Conceptual model to predict Filipino teachers' adoption of ICT-based instruction in class: Using the UTAUT model. *Asia Pacific Journal of Education*, 0(0), 1–15. https://doi.org/10.1080/02188791.2020.1776213

Kleinsasser, R. C. (1993). A tale of two technical cultures: Foreign language teaching. *Teaching and Teacher Education*, 9(4), 373-383. http://dx.doi.org/10.1016/0742-051X(93)90004-Z

Koehler, M., & Mishra, P. (2009). What is Technological Pedagogical Content Knowledge (TPACK)? *Contemporary Issues in Technology and Teacher Education*, *9*(1), 60–70.

Kotter, J.P., 1947. (1990). *A force for change: How leadership differs from management*. Free Press.

Law, N., Yuen, A., & Fox, R. (2011). Changing Leadership Roles in Changing Times. In N. Law, A. Yuen, & R. Fox (Eds.), *Educational Innovations Beyond Technology: Nurturing Leadership and Establishing Learning Organizations*, 195–215. Springer US. https://doi.org/10.1007/978-0-387-71148-5_10

Lee, Y., Kozar, K.A., & Larsen K. (2003). The technology acceptance model: Past, present, and future. *Communications of the Association for the Information Systems*, 12(50), 752-780

Li, K., Li, Y., & Franklin, T. (2016). Preservice Teachers' Intention to Adopt Technology in Their Future Classrooms. *Journal of Educational Computing Research*, *54*(7), 946–966. https://doi.org/10.1177/0735633116641694

Lieberman, A. (1988). *Building a professional culture in schools*. Teachers College Press.

Lieberman, A. (1990). *Schools as collaborative cultures: Creating the future now*. Falmer Press.

Limayem, M., Hirt, S.G., & Christy M. K. Cheung. (2007). How habit limits the predictive power of intention: The case of information systems continuance. *MIS Quarterly*, 31(4), 705-737. https://doi.org/10.2307/25148817

Lombardi, M. M. (2007). Authentic learning for the 21st century: An overview. *Educause learning initiative*, *1*(2007), 1-12.

Lowenthal, P. (2010). *The evolution and influence of social presence theory on online learning*.

Madden, T. J., Ellen, P. S., & Ajzen, I. (1992). A Comparison of the Theory of Planned Behavior and the Theory of Reasoned Action. *Personality and Social Psychology Bulletin*, *18*(1), 3–9. https://doi.org/10.1177/0146167292181001

Magsamen-Conrad, K., Upadhyaya, S., Joa, C.Y., & Dowd, J. (2015). Bridging the divide: Using UTAUT to predict multi-generational tablet adoption practices. *Computers in Human Behavior*, 50, 186-196

Maslowski, R. (2001). *School culture and school performance*. Twente University Press

McLaughlin, M. W. (1993). What matters most in teachers workplace context? In J. W. Little & M. W. McLaughlin (eds.), *Teachers work: Individuals, colleagues, and contexts*, 79-103. Teachers College Press.

McLean, C., & Rowsell, J. (2019). Digital Literacies in Canada. *Preparing Globally Minded Literacy Teachers: Knowledge, Practices, and Case Studies*.

Mintzberg, H. (2004). *Managers not MBAs*. Berrett-Koehler.

Muhammad, A. (2009). *Transforming school culture: How to overcome staff division*. Solution Tree Press.

National Center for Technology Planning. (2010). *Guidebook for developing an effective instructional technology plan version 3.5*. National Center for Technology Planning.

North Okanagan-Shuswap School District 83. (2019). *SD83 Educational Technology Plan.* Retrieved from: https://sd83.bc.ca/wp-content/uploads/2019/11/EdTech-Plan-FINAL-1.pdf

Oliveira, T., Thomas, M., Baptista, G., & Campos, F. (2016). Mobile payment: Understanding the determinants of customer adoption and intention to recommend the technology. *Computers in Human Behaviour*, 61, 404-414

Ontario Ministry of Education. (2007). The Ontario Curriculum Grades 1-8: Science and Technology [Curriculum document]. http://www.edu.gov.on.ca/eng/curriculum/elementary/scientec18currb.pdf

Picciano, A. G. (2011). *Educational leadership and planning for technology*. Pearson.

Prestridge, S. (2019). Categorising teachers' use of social media for their professional learning: A self-generating professional learning paradigm. *Computers & Education*, 129, 143–158. https://doi.org/10.1016/j.compedu.2018.11.003

Raish, V., Schroth, S., & Carr-Chellman, A. (2018). Leading e-Learning Schools from a Systemic Perspective: A Guide for K-12 Leaders. In A. A. Piña, V. L. Lowell, & B. R. Harris (Eds.), *Leading and Managing e-Learning: What the e-Learning Leader Needs to Know*, 369–388. Springer International Publishing. https://doi.org/10.1007/978-3-319-61780-0_25

Rispin, K. (2015). *Pillars of Technology Implementation: Asking the Questions That Lead to the Successful Integration of Technology into Public School Settings* (Masters Thesis), https://dspace.library.uvic.ca/bitstream/handle/1828/6948/Rispin_Keith_MEd_2015.pdf?sequence=4&isAllowed=y

Rogers, E. M. (1962). *Diffusion of innovations*. Free Press of Glencoe.

Rohaan, E. J., Taconis, R., & Jochems, W. M. G. (2010). Analysing teacher knowledge for technology education in primary schools. *International Journal of Technology and Design Education*, *22*(3), 271–280. https://doi.org/10.1007/s10798-010-9147-z

Rosenholtz, S. J. (1991). *Teachers workplace: The social organization of schools*. Teachers College Press.

Ryan, R. (2007). *Leadership development: A guide for HR and training professionals*. Butterworth-Heinemann.

Sato, K. & Kleinsasser, R. C. (2004). Beliefs, practices, and interactions of teachers in a Japanese high school English department. *Teaching and Teacher Education*, 20, 797-816. http://dx.doi.org/10.1016/j.tate.2004.09.004

Schein, E. H. (2010). *Organizational culture and leadership* (4th ed.). Jossey Bass.

Scherer, R., Siddiq, F., & Teo, T. (2015). Becoming more specific: Measuring and modeling teachers' perceived usefulness of ICT in the context of teaching and learning. *Computers & Education*, *88*, 202–214. https://doi.org/10.1016/j.compedu.2015.05.005

Schlager, M.S. & Fusco, J. (2003). Teacher professional development, technology, and communities of practice: are we putting the cart before the horse? *The Information Society*, 19, 203-220

Schleicher, A. (2011). The case for 21st century learning. *OECD Observer*, *282*(283), 42-43.

Sea to Sky School District 48. (2019). *SD48 Technology Plan (2019-2022)*. Retrieved from: https://22.files.edl.io/856b/08/11/20/203034-4b40edef-a402-4e9c-903f-92aa38a4c4d3.pdf

Shabani, K., Khatib, M., & Ebadi, S. (2010). Vygotsky's Zone of Proximal Development: Instructional Implications and Teachers' Professional Development. *English Language Teaching*, 3(4), p237. https://doi.org/10.5539/elt.v3n4p237

Shute, V. J., & Rahimi, S. (2017). Review of computer-based assessment for learning in elementary and secondary education. *Journal of Computer Assisted Learning,* 33(1), 1-19. https://doi.org/10.1111/jcal.12172

Siddiq, F., & Scherer, R. (2016). The relation between teachers' emphasis on the development of students' digital information and communication skills and computer self-efficacy: The moderating roles of age and gender. *Large-Scale Assessments in Education,* 4(1), 1-21. https://doi.org/10.1186/s40536-016-0032-4

Skaalvik, E. M., & Skaalvik, S. (2009). Does school context matter? Relations with teacher burnout and job satisfaction. *Teaching and Teacher Education*, *25*(3), 518–524. https://doi.org/10.1016/j.tate.2008.12.006

Smith, J.A. and Sivo, S.A. (2012). Predicting continued use of online teacher professional development and the influence of social presence and sociability. *British Journal of Educational Technology*, 43, 871-882. https://doi.org.ezproxy.library.uvic.ca/10.1111/j.1467-8535.2011.01223.x

Snoeyink, R., & Ertmer, P.A. (2002). Thrust into technology: How veteran teachers respond. *Journal of Educational Technology Systems*, 30(1), 85

Stockless, A. (2018). Acceptance of learning management system: The case of secondary school teachers. *Educ Inf Technol,* 23, 1101–1121. https://doi.org.ezproxy.library.uvic.ca/10.1007/s10639-017-9654-6

Stoeber, J., & Rennert, D. (2008). Perfectionism in school teachers: Relations with stress appraisals, coping styles, and burnout. *Anxiety, Stress, and Coping*, 21(1), 37-53. https://doi.org/10.1080/10615800701742461

Straub, E. T. (2009). Understanding technology adoption: Theory and future directions for informal learning. *Review of Educational Research, 79*(2), 625-649. https://doi.org/10.3102/0034654308325896

Straub, E. T. (2017). Understanding Technology Adoption: Theory and Future Directions for Informal Learning. *Review of Educational Research*, *79*(2), 625–649. https://doi.org/10.3102/0034654308325896

Sun, Y., & Gao, F. (2019). Exploring the roles of school leaders and teachers in a school-wide adoption of flipped classroom: School dynamics and institutional cultures. *British Journal of Educational Technology*, *50*(3), 1241–1259. https://doi.org/10.1111/bjet.12769

Sunshine Coast School District. (2018). *Strategic Plan for Technology in School District 46 (2018-2023)*. Retrieved from: https://technology.sd46.bc.ca/wp-content/uploads/sites/17/Technology-Strategic-Plan-2018_2023.pdf

Tang, H., Lin, Y.-J., & Qian, Y. (2020). Understanding K-12 teachers' intention to adopt open educational resources: A mixed methods inquiry. *British Journal of Educational Technology*, *51*(6), 2558–2572. https://doi.org/10.1111/bjet.12937

Tearle, P., & Golder, G. (2008). The use of ICT in the teaching and learning of physical education in compulsory education: How do we prepare the workforce of the future? *European Journal of Teacher Education*, 31(1), 55-72. https://doi.org/10.1080/02619760701845016

Theelen, H., Beemt, A. van den, & Brok, P. den. (2020). Enhancing authentic learning experiences in teacher education through 360-degree videos and theoretical lectures: Reducing preservice teachers' anxiety. *European Journal of Teacher Education*, 0(0), 1–20. https://doi.org/10.1080/02619768.2020.1827392

Tondeur, J., Van Braak, J., Sang, G., Voogt, J., Fisser, P., & Ottenbreit-Leftwich, A. (2012). Preparing pre-service teachers to integrate technology in education: A synthesis of qualitative evidence. *Computers & Education*, 59(1), 134– 144.

Trust, T. (2012). Professional learning networks designed for teacher learning. *Journal of Digital Learning in Teacher Education*, 28(4), 133-138. https://doi.org/10.1080/21532974.2012.10784693

Venkatesh, V., & Bala, H. (2008). Technology Acceptance Model 3 and a Research Agenda on Interventions. *Decision Sciences*, *39*(2), 273–315. https://doi.org/10.1111/j.1540-5915.2008.00192.x

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User Acceptance of Information Technology: Toward a Unified View. *MIS Quarterly*, 27(3), 425–478. https://doi.org/10.2307/30036540

Venkatesh, V., Thong, J. Y. L., & Xu, X. (2012). Consumer Acceptance and Use of Information Technology: Extending the Unified Theory of Acceptance and Use of Technology. *MIS Quarterly*, 36(1), 157–178. https://doi.org/10.2307/41410412

Vygotsky, L.S., Cole, M., 1938, & ebrary, I. (1978). *Mind in Society: The development of higher psychological processes*. Harvard University Press.

Wang, Y.S., Wu, M.C., & Want, H.Y. (2009). Investigating the determinants and age and gender differences in the acceptance of mobile learning. *British Journal of Educational Technology*, 40(1), 92-118

Warford, M.K. (2011). The zone of proximal teacher development. *Teaching and Teacher Education*, 27(2), 252-258. https://doi.org/10.1016/j.tate.2010.08.008

Weisse, C., & Connell, J.P. (1995). Nothing as Practical as Good Theory: Exploring Theory-Based Evaluation for Comprehensive Community Initiatives for Children and Families. In *New Approaches to Evaluating Community Initiatives: Concepts, Methods, and Contexts*. The Institute, 65-92

Willis, R. L., Lynch, D., Fradale, P., & Yeigh, T. (2019). Influences on purposeful implementation of ICT into the classroom: An exploratory study of K-12 teachers. *Education and Information Technologies*, *24*(1), 63–77. https://doi.org/10.1007/s10639-018-9760-0

Yocom, H. (2013). Implementation of the Technology Plan. In Wang, S., & Hartsell, T. (Eds.), *Technology Integration and Foundations for Effective Leadership* (pp. 102-123). IGI Global. http://doi:10.4018/978-1-4666-2656-0.ch007