

Getting connected: proposing and implementing a connected classrooms program in a public school district

by

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Bachelor of Education, University of British Columbia, 2006

Bachelor of Science, University of Victoria, 2003

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Abstract

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This project examines the theoretical and practical applications of implementing a connected classrooms video-conferencing program in a British Columbia School District. There were two guiding questions for this project: (1) How can implementing a connected classroom program increase the range and frequency of course/program offerings? (2) What are the quality teaching and learning opportunities associated with connecting classrooms through technology? The project had two defined stages: proposal and implementation of a district connected classrooms pilot program; and observations about the levels of success for implementation in classrooms. Through a synthesis of current literature regarding connecting classrooms using technology it was determined opportunities existed to increase the range and frequency of course offerings in a shrinking district. The initiation of this program has yet to result in an increase in the range and frequency of course offerings. Further, it was established that the use of video conferencing and other connective technologies did lead to highly engaging learning experiences with opportunities for high quality teaching and learning moments.

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Dedication

For my parents who have always encouraged me to pursue my goals and expected me to give nothing but my best. Thank you for teaching me the value of hard work, the power in remaining open and the importance of dedication to all I do. I am eternally grateful.

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Chapter 1-Introduction

Rural Experience/Personal Relationships

I grew up in an isolated, rural community. Due to its remoteness and lack of resources, our community strengths focused on developing collaborative personal relationships; especially the support and opportunities this could provide. Collaboration was a common means of ensuring that opportunity existed for all, while also providing the environment for exceptionally creative user agreements to be forged. Such relationships continue to this day and are prominent in rural settings. A contemporary example is the user agreement between School District 85 and the Village of Port Alice. During recent difficult economic times, the community of Port Alice received support from the District as a user participant allowing students access to the community center and arena facilities for Physical Education purposes. As a result, students participate in curling, ice hockey and other unique activities as part of their learning experience.

Recalling my youth in this isolated rural environment, it was the personal relationships that provided the earliest frameworks for collaborative initiatives. These personal relationships often extended into a variety of forums as individuals played multiple roles within the community. As a young person I learned quickly that collaboration leads to opportunities far greater than the sum of any parts which might be enjoyed by individuals. The lessons I have taken from these collaborative experiences have played a key role in my successes; both personal and professional.

Enduring and Emerging Practices

Both my formal and informal education was based around traditional means of teaching utilizing practices which have endured for many years. From year to year, these practices were often a dichotomy of effective and ineffective educational strategies dependent upon the individual teacher. This is not to say that specific teachers were entirely effective or ineffective, rather the instruction I received tended to be a blend of both.

Growing up in an isolated rural community, my experience was often that planned lessons were lacking in excitement or engagement. Whether this was due to a lack of resources or a lack of teacher creativity is still up for debate. As a young learner I became very familiar with the stand and deliver model of teaching that lead to boredom and a lack of engagement for me and my peers. Much of the teacher's time and energy was spent keeping me on task and out of trouble. While these methods were consistent with traditional teaching practices, they did little for the flexible needs of a wide range of learning styles. Additionally, a lack of diversity and modeling left me with a narrow view on multiple ways of knowing and doing.

It is important to note that most enduring practices tend to remain for a reason; they work for both teachers and students. The best teachers I have ever learned from used our surroundings and the natural environment to make learning engaging and relevant. Students were connected with local community members who provided modeling and instruction in a variety of professional areas. An important aspect of our learning involved student autonomy over the topic of study and the means for representing our learning. I can remember being allowed to use my hockey experience to do a report on human mechanics and recounts of my fishing adventures as an exploration of our local ecosystems. The teachers who had the greatest impact on my learning clearly recognized my personal interests and found ways to harness the enthusiasm I

had. Very little time and energy were spent keeping me focused and on task allowing for deep learning experiences and positive outcomes for both the teacher and myself.

The implementation of a variety of digital technologies into the classroom has resulted in the emergence of instructional practices that would not have otherwise been possible. For instance, asking a group of Grade nine math students to teach a lesson on integers to a Grade five class via video conferencing could not have occurred, even in the recent past. Teachers are building programs where they are team-teaching the same course using a hybrid model of video and online platforms. The collaborative options associated with such a teaching model are numerous and the learning opportunities only limited by the creativity of both teacher and student.

Connected Classrooms

Traditionally speaking, teaching has been a very isolating profession. I personally have complained that while I work in a building with many other educators of all roles, very little time is available to participate in the teaching experience with others. While the compartmentalized nature of many brick and mortar schools has played a key role in this sense of isolation, I realize that teacher behavior is ultimately responsible for this realized isolation; fortunately this behavior is changing. With a paradigm shift in teaching pedagogy and improved technologies it is now possible for educators to connect themselves and their students with others for a wide range of pedagogical and learning opportunities.

As a result of the experiences I had growing up, personal relationships have played a large role in my own connected classroom instructional practices. I have been able to connect my students with a variety of professionals from the community; relating community expertise to student learning. I have witnessed how this relevant context and learning has translated into

deeper understandings and higher levels of student engagement. Through personal relationships with other teachers I have been able to pair my students with other learners both in collaborative and mentorship roles leading to increased personal learning networks and higher student achievement.

The implementation of educational technologies has allowed my students and I to expand our connective capabilities well beyond the walls of our schools or the borders of our communities. With the use of video conferencing technologies I have been able to collaborate in real time with teachers remotely while still working in a rural school. This same technology has allowed my students to interact in real-time with other learners from around the globe.

Having experienced the affordances of connected classrooms first hand, it is clear that I will continue to use this as an instructional strategy. Connected classrooms are environments where learning can become a more personalized process as students develop large learning networks, leading to wide audiences and more personally relevant learning experiences.

Personal Pedagogy

My experience has been that the deepest learning takes place when individuals are actively participating in a learning process that has relevance to their personal lives. While this can occur through many different possibilities, I believe that it is best accomplished via place based instruction at various locations within the community, and through expanding learning networks beyond the classroom. Project based learning can play a key role in encouraging students to explore local learning opportunities while increasing autonomy regarding what is studied, how the learning takes place and how learning is represented. I believe the results of using these strategies include increased levels of student engagement and ownership of the learning process/outcomes. Additionally, students who find relevance in their learning

experiences derive a deeper understanding of the content explored and processes involved.

Finally, expanding the audience of a student's learning journey leads to a greater awareness of the quality of work produced.

School Inquiry Project

I am the principal of a school that participates in professional inquiry as a part of a school community learning project. Our school inquiry project asks the question; "Will our students' understanding and use of VoiceThread, and Edublogs improve our students' personal expression and formal writing skills?" It is our hope that this question will eventually encompass communication and collaboration with different cultures allowing our students to expand their global view of cultural similarities and differences. Using the Inquiry platform, our school has been able to expand the personal learning networks of not only our students, but our teachers as well. The learning experiences incurred via this project could not have occurred without expanding our learning community and opportunities that would be otherwise impossible.

Moving forward with this project, it is our hope to continue building these personal learning networks by engaging parents in the student learning journey as consumers of the Edublog/Voicethread posts. As students participate in unique, highly engaging learning experiences, we want to ensure that parents are a part of that journey not only at home but as participants in the process. It is my intention to eventually have parents guide portions of the learning journey through taking an active interest in their children's blog posts and responding with questions of their own.

Purpose

As the principal of an isolated rural school, it is my job to ensure that our students receive the highest quality education possible. I believe the best way to accomplish this is through connecting my students with other learners and a variety of professionals who can offer unique experiences providing relevance and meaning to learning. As we blend project based learning and digital connections to a larger educational community, it is my hope that student engagement will increase and the result will be deeper understanding of the topics explored.

For the purpose of my Masters project, I will work to create the context to use videoconferencing and blogging as a means to connect my school's classes with other groups of students to expand our personal learning networks. In a rural setting I believe we can make use of this technology to capitalize on opportunity which might otherwise not be available to us. I aim to connect with professionals from a variety of organizations to provide relevant instructional opportunities that my school would not otherwise have exposure to. To realize such contexts and connections, in my Masters project I will examine professional and academic literature to both identify and articulate, through a reflective blog, the blending of successful enduring and emerging instructional practices. It is my goal that this Masters work will help lead to learning opportunities of the highest potential quality for students in my school.

Chapter 2-Literature Review

Connecting classrooms using technology allows for the personalization of learning having many attributes associated with quality teaching and learning. This personalization can be accomplished by connecting learners to a broader Personal Learning Network (PLN) potentially leading to improved levels of student engagement and increased ownership over the learning process. The end goal of this increase in ownership and engagement is an overall improvement in the quality of student work and learning. John Hattie (2003) describes five dimensions that can be attributed to expert teachers, many of which are evident in the pedagogy of those currently conducting their practice in connected classrooms. Teachers who are using strategies to connect their students with other learners and outside professional experts, are blending together enduring and emerging practices; redefining what we know quality teaching and learning to be.

Connected Classrooms- A Pedagogy

Increasing numbers of students are disengaged from traditional teaching methods and the modern learner demands a personalized learning experience delivered on a flexible schedule (Abdous, 2010). Connecting classrooms using technology provides the opportunity for student learning and instructional strategies to be expanded well beyond the constraints of a traditional classroom such as: rote memorization, teacher centered approaches. Connected classrooms are learning environments where high levels of engagement occur as students work cooperatively to access information, create new ideas, build artifacts from their experiences and formulate models through project-based learning (Daley *et al.*, 2008). The principles associated with connected classrooms promote deeper understanding and authentic learning experiences while sharing many parallels with British Columbia's Education Plan (BC Ministry of Education, 2011).

Flexible scheduling and diverse course offerings that result from connected classroom opportunities increase the quality of the educational experience for the learner and result in a high sense of satisfaction on the part of the student. As Abdous (2010), “levels of learner satisfaction may be due to the fact that there was a good fit between the course delivery methods and the expectations and needs of the students” (p. 740).

Educational strategies used in the connected classroom can differ from those in the traditional classroom potentially making learning a more personalized/individualized experience for students. Students working in connected classrooms are given the opportunity to build expansive PLNs leading to wider educational audiences, authentic collaboration, and personally relevant learning experiences (Bauer, 2010). These networks allow students to find learners with similar interests and support one another throughout the learning process. Peer feedback and collaborative thought development also lead to deeper topic exploration having an extremely positive impact on learning (Hattie, 2003). Further, blending in-class lectures with online platforms creates hybrid models allowing students and teachers to create a broad range of flexible activities to meet personal needs and individual schedules.

As students’ learning networks expand, concerns about interacting with larger audiences naturally result in increased focus on effective communication and personal representation of skills development. Sir Ken Robinson stresses the significance of collaboration with these statements:

The great scientific breakthroughs have almost always come through some form of fierce collaboration among people with common interests but very different ways of thinking. This is one of the great skills we have to promote and teach – collaborating

and benefitting from diversity rather than promoting homogeneity. (Azzam, 2009, p. 25)

The above statement directly contrasts with aspects of the traditional classrooms where a teacher is often the only audience member; the latter offering little incentive for students to invest in their education program. The experience of collaborating with so many others leads to greater student engagement in the learning process and the development of a true sense of ownership over the results.

Connecting classrooms to the outside world also allows for student interactions with professionals from a variety of organizations with whom contact may not otherwise take place. Video-conferencing as a tool of education creates unique and powerful opportunities that expand learning and teaching beyond the defined roles of classroom teacher and student, often resulting in highly engaging and meaningful experiences. Whether it is a senior biology class talking with a cardiac surgeon or a dance class connecting with a professional choreographer, using technology to connect students with experts leads to high levels of student engagement and connection to the learning (Abdous, 2010).

Teachers who are most effective at using connected classroom strategies are those who tend to use them on a regular basis. Teachers who model the use of a variety of connective technologies also encourage student use without explicit instruction. Prior research in several subject areas has demonstrated that teachers tend to adopt new classroom practices based on whether the assumptions inherent in the new programs were consistent with their personal pedagogy (Harper *et al.*, 2004). Many examples exist where connecting classrooms through video-conferencing and other means is considered to be successful as a result of the professional development and collaboration of the teachers involved. The successes of one study were

premised on the fact that the leadership team and teachers working in the ‘connected classrooms’ had been responsible for developing the knowledge required to work in these environments primarily through a process of school-based professional learning activities, trial and error, collaboration with colleagues, and accessing expertise from outside of schools (Mitchell *et al.*, 2010). Schools that promote the use of connected classroom pedagogy and technology must support teachers who choose to do so through professional development and scheduled collaboration time.

Connected Classrooms- A Technology

Many models exist for using technology to connect students with other learners around the world ranging from simple emailing or conference calling to live video streaming with real-time Twitter feeds. The common pedagogy behind each of these models is that they provide opportunities for students to expand their PLN and for personally relevant learning experiences. While some educators are using individual pieces of the connectivity puzzle such as blogging or twitter, those who are fully immersed in connected learning are often employing a hybrid model of live video streaming with some form of online platform.

Live video streaming enables instructors to deliver high-quality audio and video presentations while enabling students to view, interact, and connect with their instructors and classmates (Abdous, 2010). The use of such technology creates opportunity for instructors to offer courses to remote learners and invite industry professionals to offer specialty lectures. A study conducted by Mitchell *et al* (2010) found that teachers saw the technology as relatively easy to use as it fit quite naturally with their practice, and its highly visual nature matched the ‘digital culture’ of students.

Teachers who are initially hesitant to use technology for the purpose of connecting themselves and their students often require minimal support to get started. Increasing the adoption level of technology in the classroom is regularly addressed through professional development, inquiry projects, or collaboration with colleagues who have already used these technologies (Harper *et al*, 2004). Recent studies have demonstrated that the integration of new technologies in the classroom must have a direct link to the pedagogy of the teachers charged with implementing them (Warwick *et al.*, 2010 in Al-Qirim, 2011). If video conferencing as an educational tool is to be truly embraced by teachers, those teachers need to be progressively educated and supported in its implementation.

A key aspect to the use of technology for connecting classrooms is not only the digital culture of the students but the varying levels of suitability for age appropriate learners (Shirley *et al.*, 2013). If a Grade three teacher is focused on connecting students with other learners, perhaps blogging and the formal writing process is not the best means for students to represent themselves. VoiceThread is a program that allows students to use video recording for the purpose of sharing learning experiences, providing other learners the opportunity to comment on the shared experience (Gillis *et al*, 2012). For students concentrating on written forms of expression, Twitter is an important sharing tool that forces students to synthesize a written expression or response in an extremely concise post. The power of Twitter lies in the running conversation that develops as others provide insight and feedback related to their own learning (Petrilli, 2011). Students using Twitter must first rapidly absorb information from a real time conversation and synthesize a concise yet valid contribution to the conversation. Regardless of the chosen platform, the pedagogy behind connecting classrooms remains the same; a focus on

increasing personal learning networks and student engagement in the learning process (Martinovic *et al.*, 2010; Delacruz, 2009).

High Quality Teaching and Learning

Enduring practices. Enduring educational practices have persisted throughout many educational reforms. These strategies have persisted to meet the needs of both teachers and students in the past but are also associated with high quality teaching and learning in current educational contexts. These enduring practices include: strong teacher student relationships; a focus on teaching ‘the basics’; assessment of learning through standardized testing; and differentiated instruction (McGregor & Sanford, 2013).

There has long been an argument that the teacher-student relationship is a foundational basis for learning. It is well described that positive student teacher relationships lead to improved school adjustment, increased social skills and promote academic performance (Hamre & Pianta, 2001). Many students have described emotional responses to teachers as governing much of their academic behavior (Bernstein-Yamashiro, 2013). Evidence to suggest the benefits of a strong student teacher relationship is further supported by the lack of success in those situations where it is difficult for teachers and students to connect on a personal level. “They often did not seek help learning material from teachers who seemed threatening, and they did not take intellectual risks in uncomfortable settings” (Bernstein-Yamashiro, 2004). Large secondary schools where teachers are not given the time or opportunity to connect with students beyond learning in the classroom are often linked to reduced academic success and even increased drop-out rates (Hamre & Pianta, 2001).

Various strategies have been used to assess learning in multiple aspects of the educational process. Assessment of learning has long been touted as a means to measure, rank and order the

performance of individual students in a relative comparison to their peers. The many biases and misuse of standardized tests is well documented and often a point of contention for teachers, parents and administrators alike (Sacks, 2000). Despite these concerns, standardized tests have continued to be an important part of the prescribed curriculum and play a large role in determining student success on both a personal level and broad scale.

For many generations, quality teaching strategies and education in general have focused on students learning ‘the basics’. These basics have often been referred to as reading, writing and arithmetic; and are encompassed by a set of prescribed learning outcomes that teachers work to ensure their students have mastered. The defined basics have changed little over the past 100 years and provide an important consistency in skill and content knowledge when educational reform is seen to be struggling (Christie, 1990).

Differentiated instruction is a term used to describe practices that have been utilized by good teachers for many years. Teachers using best practices have long recognized that individual students learn differently; therefore they vary the activities and assignments they use to explore topics throughout the school year. Differentiated instruction provides the learner with multiple representations of the same topic and multiple modes for engagement in an effort to find the most effective instructional strategies. This same principle is also applied by effective teachers to assessment methodologies as variation in assessment allows students to represent their learning in multiple ways, highlighting personal strengths (Hattie, 2012).

Emerging practices. In addition to many of the enduring educational practices associated with quality teaching and learning, new practices associated with highly effective learning situations are emerging. Technology plays a large role in this process and while these

emerging practices are still developing, some of the strategies are clearly associated with student success.

A radical shift from the traditional model of top down, teacher directed learning is the movement toward student centric learning programs. One of the more popular and highly regarded models is referred to as Universal Design for Learning (UDL). UDL is characterized by a curriculum that provides multiple means of representation, expression and engagement (King-Sears, 2009). Creating learning environments that allow for these multiple means require specific and targeted approaches regarding inclusion during instructional lesson planning (McGhie-Richmond & Sung, 2009). Teachers employing UDL in their lesson planning are seeing improved success for a broader range of learners in their classrooms.

The practice of giving students a voice in the learning process is rapidly becoming an important aspect to improving levels of student engagement. As students invest emotionally in their education, levels of engagement dramatically increase leading to improved academic success (Linnenbrink-Garcia & Pekrun, 2011). As evidenced by the British Columbia Education Plan (2011), the movement toward personalized learning is shifting from small pockets of practice to one of general policy throughout entire education systems. Personalized education is described as a tailoring of the pedagogy, curriculum and learning environment to meet the needs and wants of individual learners (Kinshuk, 2012). While the task of personalizing education to meet the needs and aspirations of individual learners is a daunting one, the benefits are obvious and approaches such as UDL provide the framework to enable this movement.

A current leadership movement gaining momentum in education is Inquiry Based Learning. As a pedagogical method, Inquiry Based Learning involves small-scale research problems that are often assisted by a facilitator (Volkert, 2012). Key aspects behind the

pedagogy of Inquiry Based Learning are metacognitive revolving around three questions that every learner should be able to answer: Where am I with my learning?, How do I know I'm being successful?, and Where to next? (Halbert & Kaser, 2013). Learners working within the context of inquiry-based study are constantly self-assessing work and re-evaluating hunches in an action based process that has powerful implications for learning. Teachers and schools practicing Inquiry Based Learning are exposing their students to deep learning experiences and opportunities to develop skills that go beyond rote learning.

In an effort to support the deep learning experiences associated with Inquiry Based Learning, many educators are moving away from prescribed learning outcomes toward a new set of basics often referred to as the 'Big Ideas'. These key themes related to student concept mastery and skills development allow learners to explore content on a deep level rather than skimming the surface for content knowledge. Identifying the Big Ideas in specific subject areas has become an important focus for educational administrators and teachers alike as we move toward a model of personalized learning. Response to Intervention (RTI) is a model that uses formative assessment methods to determine student needs and then provide learners with targeted instruction to support these needs (Buffum, Mattos and Weber, 2012; Goode, 2010). An important element to RTI is the 'unpacking of curriculum' to identify the key aspects of learning outcomes. As teachers discover those aspects crucial to student success, they can provide specific, targeted instruction that supports skills development rather than content knowledge.

Technology is an important driver in the emergence of new effective teaching strategies. The ability to connect over great distances in real-time has expanded personal learning networks for both students and teachers alike. Teachers who collaborate in both lesson planning and delivery through the use of technology provide unique learning experiences that are highly

engaging and relevant to personal interest. Students who connect with other learners via technology have large audiences over which to disseminate their work leading to greater ownership of the realized product. Technology also provides teachers with important mentoring and coaching opportunities not otherwise afforded to them, thereby creating greater collaboration networks and improvements in shared learning extending beyond classrooms, schools and districts.

Expert Teaching - Essential Elements to Student Success

While many factors play a role in the realized outcomes of student success, teachers account for about 30% of the variance in a student's achievement (Hattie, 2003). It is this tremendously large affect that necessitates an analysis of what it is that defines expert teaching and how this differs from experienced teaching. According to Hattie (2012), there are five major dimensions that can be attributed to excellent teachers. He states that expert teachers:

- can identify essential representations of their subject,
- can guide learning through classroom interactions,
- can monitor learning and provide feedback,
- can attend to affective attributes, and
- can influence student outcomes.

Expert teachers possess knowledge that is integrated with content from other lessons and relate instructional strategies to their student's needs and goals. These strategies are further personalized by connecting to prior knowledge, and making learning a personally relevant process. Teachers who have reached a level recognized as expert are highly attuned to the needs and strengths of their learners and therefore often approach learning contextually in regard to their classrooms and students.

Teachers who are noted for their highly successful impact on student learning are continually evaluating what has been accomplished in the classroom, using these findings to plan the next course of action (Jaggers, 1961). These are teachers who constantly seek feedback information about their teaching and student learning. This feedback plays a crucial role in determining the specific needs of each learner and the effectiveness of strategies being used to address these needs. According to Hattie (2003) teacher feedback is the most powerful single moderator related to enhancing student achievement. In his 2009 book, *Visible Learning*, Hattie clearly the necessity of this feedback in the delivery, evaluation and future planning of their teaching.

Teachers need to know the learning intentions and success criteria of their lessons, know how well they are attaining these criteria, and know where to go next in light of the criteria of: “Where are you going?” “How are you going?” and “Where to next?” (Hattie, 2009, p. 239)

Expert teachers are also very adept at building classroom cultures where errors are welcomed and student questioning is prominent. In these environments students take pride in recognizing that they can be effective learners. These teachers choose to use instructional language that leads to greater learning opportunities and less focus on student behavior or teacher direction. In these situations, expert teachers have a high respect for their students, are passionate about teaching and learning and use their mastery of these skills to create free working memory. This additional working memory allows the teacher to address the more complex challenges associated within a given classroom context. It is the freeing up of this working memory that allows expert teachers to address the more complex challenges associated

with a classroom context, meet the specific needs of struggling learners and to elevate the achievement of those already meeting expectations.

Finally, expert teachers are those who through a process of Inquiry Based Explorations, develop in their students self-regulation, mastery learning, enhanced self-efficacy and self-esteem resulting in a positive impact on student achievement. These teachers help students improve their surface learning of content knowledge and then make connections that relate and extend this knowledge to a broader scope of understanding.

Conclusion

In an era where students are demanding a personalized learning experience, quality teaching and learning is of the utmost importance. Teachers who use technology to connect their students with other learners and industry professionals dramatically expand personal learning networks while creating relevant, meaningful and highly engaging learning experiences. Expert teachers are using these connected learning principles to blend enduring and emerging educational strategies, redefining quality teaching and learning as we know it.

Chapter 3-Getting Connected

The seeds for this project were originally planted in conversations with colleagues about connecting the secondary schools in our district beyond a few sporting events each year. In a shrinking district affected deeply by budget cuts, the range and frequency of programs being offered has continually reduced. As a group, we felt the opportunities provided by connecting classrooms through videoconferencing and online platforms could expand the frequency and range of programs offered by the district. If teachers were to adopt the practice of regularly delivering learning experiences through videoconferencing a database of lessons could be created to support students demanding a flexible schedule for their learning. Additionally we felt that using this model provided many opportunities for quality teaching and learning practices through connecting learners to relevant and meaningful learning experiences while supporting student collaboration and peer feedback.

First Impressions

Initially, our district showed a keen interest in adopting a connected classrooms model toward taking steps to structure schedules and learning environments that would be supportive of teachers using these practices. Teachers expressed a desire to further develop connected classroom practices and sense of excitement accompanied the start of the 2013-2014 school year. More recently there have been some roadblocks to the consistent application of connected classroom practices resulting in an implementation dip for which the final outcome is yet to be determined.

I first took an active interest in using videoconferencing to connect classrooms during January of 2013 as part of a technology in education course assignment for our master's program. Recognizing an opportunity to connect learners while increasing the range of

programming offered, I began working on a district proposal to connect our two secondary schools through videoconferencing, online platforms and face to face interactions. This proposal was submitted to senior administration in April of 2013.

The intention of this proposal was to allow for the remote teaching of lessons as well as increased student exposure to exceptional learning opportunities. In a district with a rapidly shrinking enrollment the realities of reduced funding have been evident in schools. Our secondary schools have been required to cut back on the range and frequency of courses; offering certain academic subjects only on alternating years. While providing courses in this manner ensures that schools are still offering important core academic subjects, it means that student schedules become fixed leaving little or no opportunity for choice in elective courses. Adopting a connected classrooms model would not only give teachers the opportunity to connect their learners with outside professionals, but schools would be able to offer courses more frequently. Scheduling teachers to remotely deliver courses would allow schools to improve on our current situation and offer senior academic programs such as physics, chemistry and math on a yearly basis. Students participating in courses offered through this model would benefit from increased collaboration and peer feedback supporting the intention to increase quality teaching and learning experiences.

The submitted proposal suggested that in addition to making use of existing technology a broadcast studio be built at each secondary school to allow for the transmission of video and audio feeds between the two locations. Moving forward with the project, the district has hired the necessary staff to begin construction of these studios and is currently preparing designated rooms for equipment installations. A built-in component of the proposal is the recording of all instruction delivered in the broadcast studio to begin compiling a database of high quality lessons

for future use in distributed learning courses catering to students requiring flexibility in their learning schedule. This flexibility would be further supported through increased development of our distributed learning program including online Moodle platforms allowing students to access assignments and lessons on a schedule that meets individual needs.

Submission of the proposal was met with a positive response from all interest groups including; students, teachers, school administrators, senior administration and members of the board of trustees. Students felt that having the opportunity to do coursework on a flexible schedule without alternating academic courses yearly would be of great benefit. Other students expressed a desire to be connecting with remote teachers and learners to expand their learning audience and personal learning networks beyond the typical classroom experience. Examples of such possibilities include connecting biology classes with marine biologists from Vancouver Aquarium or videoconferencing through French lessons with classes from great distances away. Teachers in the district who are already employing connected classroom pedagogies offered to mentor those willing to adopt related practices. It was recognized as an extremely valuable offer to have this mentorship available as teachers worked through the difficulties of implementing a variety of personally desired connected classroom practices. Some of these difficulties include adoption of new technologies, collaborative challenges and developing instructional programs. Several of the teachers already employing connected classroom pedagogies spoke of the powerful learning experiences occurring in their classrooms not only for students but for themselves as well. School principals, who expressed desire to have increased timetabling options and improved course offerings recognized the value in connecting learners between the two secondary schools. Senior administration acknowledged the benefits of increasing range and frequency in program offerings in addition to validating the quality teaching and learning

experiences available to students in these environments. Some of the concerns raised by individuals were: limited bandwidth, associated costs, timetabling and professional development. While these logistical concerns provided some caution about entering into a connected classrooms pilot project, all parties were essentially very excited to be committed to making this happen.

Implementation

The first major hurdle to establishing a connected classrooms program between the two secondary schools was aligning bell schedules. At the time this proposal was submitted, these schools operated on drastically different bell schedules making it very cumbersome to remotely connect learners exploring the same topic. While school was working on a five block daily rotation with shortened Fridays while the other school operated on four blocks consistently. Through an alignment of the bell schedules, principals would be given the opportunity to schedule timetables that allowed for reflective pairing of courses. Capitalizing on these pairings, teachers and students would be afforded the opportunity for collaboration and peer feedback on a consistently scheduled basis. Through these experiences, students are given the opportunity to develop personal learning networks leading to increased collaboration and peer feedback; both strong indicators of quality teaching and learning.

Consultations with community members, staff, students and the board led to a synchronized bell schedule focused on maximizing opportunities to connect learners between the two schools through videoconferencing and face to face interactions. The initial reaction from many individuals was resistance to change and concerns about some components of the new schedule. A specific aspect of the new bell schedule is a daily two hour scheduled block of time for teachers to explore topics through in-depth learning experiences. Many teachers have argued

that two hours is too long for students to spend on a single subject; describing student disengagement and difficulty “filling in the time”. Our experience has been that very few teachers have embraced this opportunity for deep exploration of topics and have not changed how they teach and the manner in which their students learn. Some teachers have used this time to connect students with remote learners (digitally and face to face) in a manner that the old schedule couldn’t accommodate.

Specific examples of programs that have been successful include the senior secondary field studies program the grade 8 Science Odyssey program. In the field studies program students regularly meet to experience career and trade opportunities related to our economic region. According to my knowledge there is no technology dependent connection occurring between groups from each school. It is my view that there is much potential for growth in this area as bringing students together for collaborative work early in the school year should develop relationships that provide a foundation for ongoing connection. Students participating in the Science Odyssey program were given some pre-teaching in the classroom to prepare them for a large face-to-face collaborative learning experience. This experience brought all the students together at a central location to explore a variety of environmental science principles in an applied manner. Students worked in a collaborative manner to test water qualities, perform field studies and propose hypotheses all while giving and receiving peer feedback. An additive component of this connected experience was an attempt to build relationships and familiarity between students to help support further connection through technology. To date, the follow up connection has been unsuccessful with little or no communication between the two groups. It is my understanding that teachers have had difficulty maintaining this connection through technology due to a difference in school timetables preventing coordination of videoconferences

and a lack of teacher commitment to ongoing connection. Teachers from each school who were involved in the large face-to-face collaborative experience didn't teach the students at the same point in the day and thus didn't make time for ongoing connection through videoconferencing. I don't know of any particular barriers to continuing the connection through video conferencing beyond the lack of synchronized timetables as described.

Closely related to the synchronizing of bell schedules was the alignment of teaching timetables between the two schools. During the research phase of this proposal, I discovered that Grande Yellowhead School District from Alberta clearly stated that alignment of schedules greatly facilitated the connective opportunities for teachers and students in their school district (Graham, 2013). Taking into account the similarities and differences in demographics between the two schools there are many opportunities to realize timetables that are reflective and complementary of each other. For reasons unknown, principals at the two schools were only able to align a couple courses for the 2013-2014 school year. Principals offered little explanation for the minimal alignment of timetables beyond expressing a desire to enter into the experience cautiously. Fortunately for myself, I was slated to teach one of these classes.

As the 2012-2013 school year came to an end, there was plenty of excitement about moving forward with a connected classrooms pilot program using videoconferencing and online platforms. I had positioned myself to be teaching Biology 11 specifically aligned to coordinate the same course being offered at the other secondary school and had begun developing a working partnership with my counterpart in preparation for the upcoming year. Both myself and my colleague recognized many opportunities for quality teaching and learning through student collaboration, peer feedback and highly engaging activities. All of this changed on the last day in June when I was assigned the principal-ship of a different school in our district.

New Challenges and Goals

With a change in schools and roles, my goals for connecting classrooms shifted in perspective. The careful planning and relationship building I had invested to ensure learners were being connected through video conferencing and online learning needed to be applied in a different manner for my new situation. I was no longer teaching Biology 11; instead my teaching would be more focused on elementary curriculum requiring me to forge new connections and relationships to make videoconferencing possible. Further, I was no longer focused on only my teaching as I had become responsible for overseeing the instruction of an entire school. While there are some major technical restraints to accomplishing many of my connected classroom goals, I have been fortunate to join a school that sees value in this type of educational practice.

The school I have joined actively employs connected classroom pedagogy through videoconferencing with outside professionals and other learners in addition to using online platforms. Our instruction engages in connecting classrooms several ways including an inquiry project making use of student blogs and VoiceThread software focused on improving student expression and formal writing skills. This project has been in progress for two years and although there have been difficulties maintaining an ongoing connection with other learners, there are many elements of high quality teaching and learning in place. Examples of these difficulties include: purposeful exchanges, differences in learning levels for participants and a lack of commitment to ongoing collaboration. From a high quality teaching and learning perspective, students are using these technologies to self-assess, reflect on the work of others and provide peer feedback to guide improvements in formal writing and inquiry project development. Teachers at our school have also used Skype to bring outside professionals into the classroom;

interacting with local and urban marine biologists has made connections to the learning that are relevant and meaningful. Despite the strong effort of teachers in our school, it is still a struggle to convince others to connect with our students.

Students in our intermediate program are using VoiceThread to record learning experiences and share those experiences with others. Individuals can use either still images or video sequences and attach an audio file or text to describe their work. These images or video clips are often representative of a performance, project or key idea that students have worked on in class. After creating and posting the presentation, others are invited to share in the product commenting on the work and asking questions. Through these posts, students are also able to share their learning experiences with people outside of the classroom; the intended result being development of personal learning networks. These experiences reflect quality teaching and learning as peer feedback and collaborative thought development are supported by personalized learning networks leading to deeper topic exploration and having a positive impact on learning.

There have been many positive gains for students using VoiceThread, though some have resisted engaging with important aspects of the program. In a recent experience, students were conducting an inquiry based investigation into the building of paper towers. Despite showing strong content knowledge and inferences related to engineering, one student was unwilling to record any audio or video clips to explain his thinking. This student preferred to use a text feature allowing him to explain his thoughts in a less personal way. It is understandable that this student wants to maintain privacy and ultimately his actions allowed him to meet our goal of increasing our students' level of personal expression. Since some students are not fully engaging with the VoiceThread program I can only surmise that these individuals are not developing personal learning networks as intended. Further, some students are reluctant to share

VoiceThread posts with parents/professionals or respond to comments from these same individuals. This reluctance demonstrates to me that the use of technology can help facilitate meaningful and relevant experiences for our students but it doesn't guarantee they will embrace the full potential of the experience. Students who do embrace these connective experiences are realizing high levels of achievement as evidenced by our older students' success with blogging.

In our junior secondary program, a class blog was set up to share learning experiences and connect with other learners both in and out of our classroom. All of these attempted connections are based on prior planning where the classroom teacher has worked to prepare both students and remote individuals. Within this blog are individual student blogs showcasing specific assignments and writing achievements allowing others to view a variety of work. The main intention of these blogs is to develop formal writing skills through exposure to broader learning audiences and peer feedback. Students in the class are encouraged to read and comment on posts from other blogs, providing positive feedback and suggestion for improvement. As previously stated, this peer feedback extends learning leading to deeper understandings and strong connections. By facilitating this self-reflection and peer feedback the teacher is providing high quality instruction. Students participating in the blogging process have become increasingly aware of where they are as writers and where they would like to go with their writing. Sharing work on the blog platform has led to increased peer feedback, self-assessment and comparison to performance standards. This is evidenced by the teacher-student collaborative development of personal writing profiles highlighting individual strengths and needs based upon feedback from the blogging experience. In this sense our project has been a success as school assessment data has shown an improvement in formal writing skills when compared to previous assessment and performance standards.

An important aspect of the individual student blogs was the intent to connect our learners with students from remote locations. Ideally, students would establish and develop a relationship through blog exchanges and eventually lead to videoconferences. It was hoped this connection would be established in a long term fashion with ongoing regular exchanges. In my opinion this has occurred with extremely limited success. Much of the difficulty lies in convincing others to view our student work and then comment on what they have read. Despite the good intentions of several teachers and administrators, the feedback provided to student work by peer learners has been extremely minimal and often not constructive. For example, blog comments from remote peer students are often directed toward the size of our community and what do the students do for fun. Rather than provide a focused purpose for connecting our learning these exchanges have detracted from the process and ultimately led to a tailing off of exchanges. The reasons for this are numerous and complex including: lack of purpose, ability of peers to provide quality feedback, teacher investment and personal relevance. What has become clear is willingness to develop a lasting, purposeful relationship has effectively been the greatest roadblock in preventing us from consistently connecting students with others for educational purposes via technology. This lack of will to establish a long term connective relationship has been demonstrated by students regarding connections planned for academic purposes. A possible solution for this problem is to connect learners individually rather than in groups; this could allow for connections based on similar interests leading to the establishment of a long term relationship. This avenue would require further exploration as I did not come across any literature describing the evolution of educational exchanges from the social use of social media.

While our school inquiry project has focused on using technology to connect students with other learners, our connected classroom instructional practices extend well beyond this.

Teachers at our school regularly connect their students to outside professionals for the purpose of extending conceptual thinking and to make learning meaningful and relevant. These digital connections to outside professionals usually occur through Skype and relate in class learning to prior knowledge and new findings. For example, an important experience for our learners involved the rescue of a sea lion pup in our community. The sea lion was discovered by some of our students and after several days of monitoring it hadn't returned to the water. Eventually, conservation officers had the sea lion transported to the Vancouver Aquarium for rehabilitation. During the time the sea lion was at the Aquarium our students were able to Skype with a biologist who was overseeing the rehabilitation process. Students were given updates and tracked the ongoing process for the sea lion they had "rescued" continually building knowledge in a locally and personally relevant manner. The experiences of connecting with the biologist from Vancouver Aquarium were further supported by the development of inquiry based projects to predict the reasons why a sea lion needed to be rescued. The culmination of this experience was a gathering for the release of a different recovered seal pup bringing together learners, teachers, professionals and rescuers. Students eventually wrote a book about their experience thereby further extending their learning to include future students. This book has been used in the future not only as an informational reference, but also to indicate the relevance and meaning that local experiences have to our learning and as an example of the high quality performance from students at our school.

Currently, students in our school are connecting via Skype with a local biologist to discuss the recent phenomenon known as sea star wasting syndrome. After using Skype to deliver several information sessions about the nature of the phenomenon, students developed individual inquiry based projects to come up with a hypothesis describing the likely causes.

Once again the connections to learning are locally relevant and meaningful leading to high levels of student engagement and deep learning. Class members are invited to give feedback and offer further development of each hypothesis. Students have used Skype to discuss their hypothesis with the biologist receiving feedback about their proposals and further information about the progression of the disease. Additionally, students have created VoiceThread presentations to demonstrate their learning and provide a platform for further feedback from the local biologist. These VoiceThread presentations are characterized once again by similar shortcomings experienced in previous projects with students' reluctance to record audio and video sequences. One student in particular demonstrated impressive insights into overpopulation and disease amongst sea stars demonstrating a strong connection to prior knowledge and cross curricular applications. Although this learner is fully engaged in the sea star wasting project and willing to express her thoughts, she also refused to record questions and responses in an oral format; preferring instead to rely on text based features.

These presentations are currently being posted as parents, friends and other learners are invited to join the conversation asking questions or making comments. While it is hoped that many of these individuals will comment on our presentations, our experiences tell us that a majority of comments come from very few individuals. Employing a survey related to our inquiry project's use of technologies for connecting our students to others, there were only thirteen respondents. Of these respondents only two users indicated having commented on student work. In discussions with these individuals it becomes apparent that familiarity with the technology plays a role in the lack of commenting for some while others express a lack of interest in participating.

While there are examples of students in our school connecting their learning using technology, not all attempts have realized such positive results. At our school there is an extremely well equipped woodshop that is underutilized due to the lack of a qualified woodshop teacher. As part of the transition into my new role I worked directly with a shop teacher attempting to remotely connect my learners for some basic instruction as a prelude to in-person instructional days. Our intention was to cover much of the safety information ahead of time through some remote learning and video conferencing to prepare for in-class visits. Following the completion of the safety training a qualified shop teacher would travel to our school for 1 day per month so students could be using power tools to work on projects. Completing the safety training via videoconferencing would ensure that we maximized the amount of useful time for students to be working with a certified teacher. Unfortunately, the planning and work that was initially done to create opportunity for such exchange hasn't resulted in any remote connections for my students. As a result of full time commitments to another school, travel restraints and a lack of qualified personnel I have been unable to facilitate the positive learning experiences as desired. It is important to recognize that in this sense the barriers haven't been technology related; rather it is largely due to a lack of availability from these personnel. I am still hopeful that we can find ways to engage my students in the woodshop through remote connections however it is becoming increasingly obvious that without a qualified shop teacher in our building, this will rely very heavily on the willingness of others to commit time and energy. I will continue to seek release time and attempt to convince our qualified shop teachers to visit our school on a regular basis as I believe our difficulties can be overcome through students completing the safety prep remotely and the dedication of one or two individuals.

From the outset of this project detractors have pointed to a lack of technical infrastructure and limited bandwidth as playing a defining role in our ability to connect classrooms through videoconferencing and online platforms. Teachers specifically point to poor internet services for our region suggesting this service limits ability to connect through videoconferencing. To the best of my knowledge, despite the occasional moments of service interruption, teachers using videoconferencing software such as Skype have largely been successful in delivering their lessons as planned. I have yet to encounter evidence of situations where planned video conferencing programs or repeated lessons were abandoned due to poor internet service. Additionally, our local internet service providers are in the process of improving infrastructure to ensure our services equal those of more urban communities. These concerns, while not always valid, have unfortunately come into play as we've attempted certain learning experiences.

Recently, a teacher at our school worked with a colleague from one of the secondary schools to facilitate a French language exchange. This single experience exchange was planned in response to the lack of success in attempting to connect on a regular basis. Students, who had written and practiced performing 14 line skits entirely in French, were planning on performing the skits for their counterparts through videoconferencing. Unfortunately, as happens here on a regular basis, internet service was not available to our school on the day this activity was planned. In this situation the teachers improvised and were able to adjust their instruction to make the learning time useful. As an adaptation the teachers chose to film the performances and then share the short video clips using Dropbox software. While there is still much value in the exchange of materials between classes, both teachers felt something was lost in not having a real-time connection for learners.

As we move forward, teachers at our school are committed to connected classrooms pedagogy and exploring the many fantastic learning opportunities associated. While we are struggling to establish ongoing long term connections for our learners, we are finding success in periodic or single connection opportunities. Examples of these single time events include connections to our local biologist regarding sea star wasting syndrome and the biologist at Vancouver Aquarium. Although there have been some challenges associated with technological infrastructure, the largest barriers to success have been related to the fragility in convincing others to connect and the extra effort necessary to collaborate in the planning process. Ironically, based on my experience thus far, the most important aspect to using technology for connecting classrooms is the prior development of a human connection; it is this human connection that drives the learning experience despite challenges and technical difficulties. When teachers are able to connect their students to other learners using technology, opportunities for high levels of engagement exist. When these high levels of engagement are applied to relevant and meaningful learning experiences students make strong connections to prior knowledge and develop deep understandings.

As we advance through the school year I have checked in with teachers at the secondary schools to determine what progress has been made around the connected classroom proposal. While some teachers have successfully connected students through videoconferencing to other learners it is typically not with groups who are exploring similar topics at the same time. Each of these connective experiences have been single time events with no establishment or development of an ongoing relationship however much value has been added to the learning experiences in these events. While there are important measures of success in the described events, not aligning the timetables between the two secondary schools has clearly been a roadblock to connecting

classrooms through videoconferencing and hybrid models. More importantly, teacher apathy and lack of engagement have been the greatest barriers to establishing ongoing connection through technology.

Of the two courses that were intentionally aligned for connective possibilities, only the junior French classes have attempted to connect using technology. These groups have experienced moderate connective success with classes making use of Skype for videoconferencing on an irregular basis. In discussion with the teachers attempting this practice it became clear that teacher to teacher connection is imperative to success in lesson delivery and follow up. Connecting classrooms through video conferencing and online platforms is only possible when teachers commit to ongoing collaboration and follow up with specific planning. This process can be greatly supported and facilitated by the coordination of bell schedules and orchestrating reflective timetables.

Despite finding some success early in the process, teachers eventually began to disengage from the practice retreating to a more familiar teaching format. The reasons given for this disengagement include: extra workload involved with planning, lack of learner engagement, and an unwillingness to push colleagues to do more. While the technology played a key role in enabling learners to remotely connect with others, teacher relationships and personal levels of commitment were ultimately the defining factors in the success of these initiatives.

Though it is early in the implementation of our district connected classrooms program there have been many positive indicators of success. District administration has committed to building broadcast studios and taken the necessary steps to begin construction. Bell schedules have been synchronized and school timetables have allowed for the alignment of some courses for the purpose of connecting in an ongoing way. Aligning courses to provide connective

opportunities doesn't guarantee this will occur, as demonstrated by the lack of connection between Biology 11 classrooms; but it does go a long way in supporting those who seek to do so. Several teachers have committed to using connective technologies as part of their teaching pedagogy and are actively pursuing connected learning experiences. With motivated individuals working in these two buildings teachers will continue attempting to connect and hopefully experience continued success. As young learners who are using connective technologies progress they bring with them knowledge and practices from prior experiences. Perhaps these students who are increasingly familiar with connective technology, for both personal and educational purposes, will be the driving force behind fully embracing the power of connected classrooms.

Chapter 4: Conclusions and Suggestions

Reflecting on the initial stages of implementing a connected classrooms program within our district it is clear that teachers who remain committed to the process are providing highly engaging learning experiences for their students. Embedded within these experiences are elements of high quality teaching and learning that are driven not by the technology itself but through teacher pedagogy and practices. It is imperative that teachers interested in using connected classroom principles receive support through professional development, collaboration time and connection to experienced professionals.

In our experience, using connective technologies has allowed students to interact with leading industry professionals to create/extend unique learning experiences that are meaningful and personally relevant. Connecting classrooms using technology can lead to environments where high levels of engagement occur as students work cooperatively access information, create new ideas, build artifacts from their experiences and formulated models through inquiry-based learning (Daley *et al.*, 2008). This is evidenced by our successful attempt at connecting with different biologists through Skype regarding the local phenomenon including as sea star wasting syndrome and the rescue of a sea lion pup from our community. High quality teaching and learning was reflected in these experiences as students worked collaboratively to develop hypotheses explaining these events through inquiry-based projects. In both instances, students were able to connect with outside professionals in a highly engaging manner over personally relevant and meaningful learning experiences. It is clear that connecting students to leading industry professionals offers opportunity for highly engaging learning experiences.

While there have been many positives in using technology to connect learners with professionals, connecting students for the purpose of peer feedback has proved to be less

successful. The intention of connecting learners in this manner is the development of personal learning networks leading to wider audiences, authentic collaboration, and personally relevant learning experiences (Bauer, 2010). Peer feedback and collaborative thought development from these personal learning networks lead to deeper topic exploration and have an extremely positive impact on student learning (Hattie, 2003). It is my experience that students have not developed these personal learning networks to the extent originally intended. While peer feedback and collaborative thought development has occurred between classmates and been correlated with improvements in student achievement, the use of connective technologies has not expanded personal learning networks beyond the walls of a traditional classroom.

A key aspect to successfully connecting classrooms through technology is the commitment level of teachers employing these strategies. Prior research in several subject areas has demonstrated that teachers tend to adopt new classroom practices based on whether the assumptions inherent in the new programs were consistent with their personal pedagogy (Harper *et al.*, 2004). Recent studies have demonstrated that the integration of new technologies in the classroom must have a direct link to the pedagogy of the teachers charged with implementing them (Warwick *et al.*, 2010 in Al-Qirim, 2011). Teachers who have been most successful at employing connected classroom practices in our district are those who tend to use them on a regular basis and who model the use of a variety of technologies. In our current context it has become apparent that many teachers who initially expressed interest in connecting their classrooms through technology have disengaged from the opportunity. One study found that the leadership team responsible for connecting classrooms had developed the knowledge and experience to do so primarily through professional learning activities, collaboration with colleagues and access to expertise from outside of schools (Mitchell *et al.*, 2010). With

increased professional development and the establishment of a district connected classrooms team there is reason to believe teachers who are already committed to the process will continue to grow and flourish in their practice. The high quality work being performed by these instructors could be further supported by administration through additional timetabling efforts and leveraged to encourage increased teacher participation.

The use of connective technologies provides opportunity for quality teaching and learning practices through highly engaging learning experiences and opportunity for peer feedback. While these are important elements of quality teaching and learning, there is little mention in my reflections on formative assessment, differentiated instruction and learner feedback. As previously described, students have become increasingly aware of themselves as writers through the blogging process which is an important element of Inquiry Based Learning. Key aspects behind the pedagogy of Inquiry Based Learning are metacognitive, revolving around three questions that every learner should be able to answer: Where am I with my learning?, How do I know I'm being successful?, and Where to next? (Halbert & Kaser, 2013). One result of information determined through the blogging process has been the development of individual writing profiles that have been used to improve student performance in a measureable way. What is unclear is whether the reading profiles or the blogging process have had an impact on student achievement. To date I have learned that connective technologies can only provide opportunity to employ quality teaching practices and that these practices must originate with the pedagogy of the teacher; technology can only help facilitate the processes associated with quality instruction.

Looking forward it is important to continue supporting those teachers who are actively practicing connecting their classrooms through technology. I feel this would be best supported

by the establishment of district leadership team comprised of teachers and administrators who are currently employing these practices. Members of this leadership team would be derived from teachers and administrators who are already practicing connecting classrooms pedagogy within our district. This leadership team could provide support and advice to teachers interested in the process and guide professional development in this area focusing specifically on nurturing the few rather than convincing the many. Further opportunities for such a team could include mentorship programs, teacher partnering applications and a review of the successes to date.

For teachers looking to employ connective classroom practices I would encourage them to begin their practice through single time events with industry professionals to create the highly engaging learning opportunities. As described previously, using technology to collaborate with professional biologists allowed teachers to create engaging learning experiences with local relevance and personal meaning. Teachers seeking ongoing connection with other learners must work continuously to maintain a relationship with their co-teacher ensuring purpose and follow through. Teachers who are unable to maintain an ongoing collaborative connection with peers shouldn't expect their students to do the same. These teachers should also model and practice the use of a variety of connective technologies in their daily teaching.

From an administrative perspective the synchronizing of timetables can greatly increase the simplicity for teachers to connect students in real time when exploring similar topics. While it is my opinion that teacher commitment is a limiting factor to success, a concerted effort to build timetables that are reflective and complementary of one another would ultimately support an increase in program range and frequency.

From a personal perspective I would encourage anyone looking to use connective classroom technology in their teaching to maintain a strong will about doing so. You will

encounter roadblocks along the way; some of which will be beyond your control. What has become obvious is; those teachers, who continually seek a connected classrooms environment for their learners, tend to create one.

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