

A Mixed Method Case Study of Student Engagement, Technology Use and High School Success

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Abstract: The relationship between technology use, student engagement and high school success was examined over two years. Surveys, interviews and classroom observations with students, teachers and school leaders informed study findings. Teachers are enthusiastic about technology, but design low level, low challenge recall assignments and tests. Student interest in learning with technology is high, but engagement tends to be low. Instruction is dominated by information delivery using display technology. Teachers must create meaningful, challenging and authentic student work that integrates technology. Leaders must create a shared vision for learning with technology in high schools; Research data on learning with technology must influence decision-making and systemic change in the education system.

Overview

To learn well in school, and to thrive and lead in a participatory and digital world, high school students need to be intellectually engaged in meaningful, challenging and complex work - work that is discipline rich, academically rigorous and motivates them to give over their hearts and minds to it. Intellectually engaging work motivates learners to challenge existing ideas, to build upon their passions and interests, and to develop explanations, arguments and solutions to problems that are complex enough to require collaborative teams of learners to investigate. It is important to move high school learning beyond the broadcast approaches that may (or may not) have served us well in the past 50 years. Today's high school learners deserved to be engaged in participatory and technology enabled learning experiences and intellectually demanding inquiry projects in school (Bransford, Cocking & Brown, 2000; Jacobsen and Friesen, 2011; Jenkins, Clinton, Purushotma, Robinson & Weigel, 2006). High school learners deserve to be well prepared for the ever-changing and digitally complex social, economic, political and cultural societies that they will inherit. The competencies and habits of mind that high school learners require to live and learn well in our media rich and socially connected global world differ from those even 10 years ago. As our participatory digital world keeps changing, school jurisdictions and high schools cannot afford to stand still.

While research has demonstrated that knowledge building is a key requirement for learners in the 21st century (Bransford, Cocking & Brown, 2000; Jacobsen, 2010a; Sawyer, 2006, 2008; Scardamalia, 2005; Scardamalia & Bereiter, 2003), most high school teaching is still characterized by information delivery and prepared messages for individuals to sit still and consume. High school students need to cultivate their ability to work collaboratively to improve ideas and share them publicly. School jurisdictions and high schools need to deploy current participatory pedagogies based on current research in the learning sciences (Sawyer, 2006, 2008) and research on how people learn (Bransford, Cocking & Brown, 2000) to make collaborative knowledge building and intellectually engaged learning a reality for all learners and teachers.

In the midst of a constantly changing and connected world, many high schools still do not or will not or cannot provide pervasive access to the robust technological infrastructures and network designs needed to serve citizens of a participatory and digital age well. While a small number of high schools now welcome student owned devices or provide 1-2-1 laptop access coupled with open, unfiltered networks for teaching and learning, most high schools struggle to maintain older computer labs and continue to dole out bookable timeslots; further, many school jurisdiction IT departments filter content and throttle the school networks, which limits further any innovative uses of technology. School jurisdictions need to put the proper technological resources in the hands of all learners and teachers. All stakeholders in education, from the Educational Ministry, to Universities, to the Professional Associations, to the school jurisdictions and community leaders, need to invest in and support teachers in designing intellectually engaging work for students to do – work that is worth their time and effort.

The question that schools systems have to face is not whether this is the technology and media environment they want because this is the connected and digitally enhanced environment that we have – global, social and pervasive. Instead, high schools need to be asking how to change the way that teachers design learning experiences

for students and how leaders and the profession can better support teachers and students in making best use of modern technological resources and open connectivity. High schools need to become spaces in which learners with diverse strengths, interests, abilities and skills are brought together around collective interests to work collaboratively on shared goals and tasks, to create and share ideas, and to build and cultivate knowledge in a community. A challenge for high school is to reconcile impoverished technological infrastructures and locked down networks, and teacher-driven content delivery approaches with the collaborative knowledge building and participatory learning approaches and expectations of today's high school students. Clearly, transformative changes are needed to move high schools from rhetoric to the realities of visible learning and visible teaching (Hattie, 2009) with technology in 21st century learning contexts.

Technology and High School Success

Improving high school completion rates is a priority for the Government of Alberta and the provincial education ministry, Alberta Education. Recognizing that high school completion has both individual and societal benefits, Alberta Education works closely with school jurisdictions to explore and support innovative strategies to improve high school completion rates. It is well known that the effective use of technology can increase student engagement, impact student achievement, increase student and teacher ICT skills and, ultimately, change teaching practices. The Technology and High School Success (THSS) initiative was part of Alberta Education's ongoing research into best practices in classroom technology implementation. In 2007, a Call for Proposals was issued to all publicly funded school jurisdictions and charter schools in Alberta for research-supported proposals that would explore the use of technology to improve student engagement and success in high school. The emphasis for this grant funding was on initiatives that demonstrated innovative uses of technology-enhanced learning environments to improve student learning and success in high school. In total, 24 school jurisdictions and/or charter schools were successful in receiving funding. A research team was funded to carry out the two-year, THSS research project in the 2008/2009 and 2009/2010 school years. The THSS initiative involved over 22,000 students and 420 teachers at over 70 schools in 24 school jurisdictions. The majority of classes involved in this initiative were Grades 9 to 12. In this paper, the authors present a selective overview of key findings from the two-year investigation. The research findings presented in this paper emphasize intellectual engagement, thoughtful and appropriate use of technology and the role of ongoing professional learning to support teacher development.

Research Questions and Methodology

The primary research question in the THSS study was, "What is the relationship between effective use of technologies, student engagement, and school success?" To answer this question, the research team explored a number of supporting questions:

1. What is the impact of technology on student engagement and success in school?
2. How was technology used to support and enhance student learning?
3. What are examples of successful models of professional learning and practice?
4. What are the essential conditions, including technical, administrative, and facility considerations that are required to support classroom technology integration in secondary school environments?
5. To what extent were the local goals of the projects achieved?
6. To what extent were the provincial goals achieved?

A mixed method case study approach was employed to answer the research question. Case study research intentionally focuses on the complexity of a single case, or a bounded system, as the phenomenon of interest for disciplined investigation (Merriam, 1997; Stake, 1995). A strength of case study research is the ability to examine, in-depth, a case or a system within its real-life context to describe what happened and why (Yin, 2009); conversely, case study is not an inferential method focused on describing causal relationships – hence, this study was not aimed at generalizable findings. The phenomenon of interest in this investigation is complex: student success in 23 of 24 school jurisdictions that were participating in the Alberta Education funded Technology and High School Success Initiative (THSS) from 2008 – 2010. Thus, a range of research methods were called for in order to capture and describe the complexity of each case, and to facilitate cross-case synthesis and explanation building (Yin, 2009).

Both multiple methodology and mixed methods are educational research terms used to describe studies that include at least one qualitative and one quantitative research method to produce knowledge claims (Smith, 2006). Mixed methods research is an approach to research that is based upon the premise that research questions should dictate the methodologies used (Johnson & Onwuegbuzie, 2004).

A mixed methods approach draws from the respective strengths of both qualitative and quantitative data collection and analysis methods and allows researchers flexibility in being able to mix and/or combine different approaches. The first reason for employing a mixed methods approach in this situation was for triangulation—leading to higher convergent validity through the use of multiple measures of similar underlying concepts—and the second reason was for complementarity—examining different elements of a concept using different methods (Green, Caracelli, & Graham, 1989). The appropriate use of a mixed methods approach, employing certain research methods that fit with a range of research goals, was considered the most appropriate approach given the complexity of the research questions in this case study.

Data Collection and Analysis

Several data sources were used to document the impact and outcomes of the initiative in two years. Data collection methods ranged from online surveys of student engagement and technology use by teachers and students, to focus groups and interviews with students, teachers, school leaders and jurisdiction personnel, to collecting field notes from site visits and probing school and district records of school completion and student achievement, to conducting classroom observations using an established protocol. Provincial achievement data, student completions and attendance patterns were triangulated with researcher sources of data.

Almost 50 schools in 23 different school jurisdictions were included; the research team focused on Grades 9 – 12 students and teachers, and various jurisdictional personnel involved in the projects: district administrators, school-based administration, team leads and technical support advisors/teams. Data were collected from approximately 3400 participants at least once throughout the project’s duration (Table 1). In addition, two site visits were conducted in the 23 school jurisdictions over the two years of the project. Site visits provided opportunities for the research team to interview participants, conduct classroom observations and engage in ongoing dialogue with leaders and teachers involved in the Technology and High School Success initiative.

Table 1: Total number of respondents

Data collection method	Year One	Year Two	Total
Online survey			
Students	1106	1327	2433
Teachers	128	166	294
Interviews / Focus Groups	52	30	82
Classroom Observations (n=40) Teachers and Students	400	200	600
Estimated Total*	1686	1723	3409

**Any aggregate participant number in our study is, by necessity, an estimate.*

Online Survey

Over 2600 students and teachers provided feedback and data for analysis via the online surveys during the two years of the study. The online student survey consisted of both select-response, fixed choice items and open-ended response items intended to gather more in-depth comments from respondents. Students were invited to participate in the survey through an initial email invitation and a follow-up, reminder email. The data collection occurred over a two-year period, with students completing the survey in both year one and again in year two. Students were not tracked from one year to the next. Two student survey instruments were used. One instrument was used to document students’ perceptions of intellectual engagement. Researchers got permission from the Canadian Education Association (CEA) to utilize parts of the survey developed for Willms, Friesen and Milton’s (2009) “What Did You Do In School Today?” study of secondary school student engagement. The other survey instrument measured students’ perceptions of technology.

Teachers were invited to complete an online survey about their instructional planning and practices. The URL for the online survey was sent to school authority contacts who then sent survey links to teachers in their school jurisdiction. The survey contained questions designed to gather information regarding teachers' use of, comfort with, opinions of technology. The summary of survey data includes results from both the quantitative and qualitative data analysis. Quantitative data consisted of descriptive statistics. A content analysis was performed on the qualitative survey data, and participant comments were coded into various response categories.

Interviews and Focus Groups

Individual and focus group interviews were conducted throughout the two years of the study. A total of 82 interviews took place over the two years (Table 1). Transcripts were initially read in their entirety for content and context, without imposing a specific analytic lens. In the second stage of transcript analysis, researchers read and coded each text independently to determine descriptive categories and criteria. Individual coding was then compared to establish consistency. These were a priori categories that arose from the research questions. Emerging themes that were outside the categories and criteria were noted and analyzed. The aim of this level of analysis was to both map out the data and review it for further analysis and to become more familiar with its content. In the final stage of the transcript data analysis, researchers reviewed critical criteria and descriptors, which created the criteria for content analysis for ongoing transcription analysis.

Using the descriptive categories and criteria that emerged from the initial data analysis, the codes of interest were created, which formed the basis for the analysis. Once all the categories and criteria from the transcripts were determined, field notes were analyzed adding any additional categories or criteria. Then the research literature was consulted to further inform and validate the categories and criteria selected. In addition, the combination of codes of interest, research literature, and field notes were used to create the criteria for the content analysis.

Researchers also analyzed the transcripts to discern patterns of experience. The transcripts were coded, noting all data that related to the patterns. The identified patterns were then expounded on and combined. Themes were defined, which were derived from patterns such as conversation topics, recurring vocabulary, recurring activities, meanings, and/or feelings. Themes that emerged from the participants' accounts form a comprehensive picture of the collective experience. In this way, the researchers were able to establish which themes and sub-themes fit together in a meaningful way.

Observational Analysis

Classroom observations were conducted during both years of the study. Observations were made in classrooms using an established classroom observation protocol (Jacobsen, Saar and Friesen, 2010). Researchers asked to observe in classrooms in which the teacher was directly involved in the THSS project. Researchers conducted disciplined observations in classrooms, and during lessons, which were chosen / identified by the school, principal or classroom teacher. In addition, field notes were made throughout the two years of the study. Classroom interactions, student engagement and instructional practices were coded using three equal intervals during a lesson (beginning, middle and final third of classroom time). These observations were then aggregated and analyzed using a combination of descriptive statistics and qualitative content analysis.

Key Relationships Between Student Engagement, Effective Use of Technology and Student Success

Student Engagement

Building upon Csikszentmihalyi's (1990, 1997) research on how people learn best – which is by doing things that are challenging and of deep interest to them, reflective of the close interplay of the emotional in cognition and the development of capacity - Friesen (2007) has defined intellectual engagement, the state in which the learner is so focused, so intensely engaged, that time itself seems to disappear, as a key goal for quality teaching and learning. An OECD report (2007) explains that at this point of engagement, the brain begins to make connections and see patterns in the information, which results in a “powerful illumination which comes from understanding” (p. 72). This state of sudden epiphany is described as “the most intense pleasure the brain can experience in a learning context” (ibid., p. 73) and naturally, is an experience that fosters motivation as students experience the pleasure inherent in deep learning.

A number of researchers (Jacobsen and Friesen, 2011; Jacobsen, Saar and Friesen, 2010; Kuh, 2001, 2003; Means, Toyama, Murphy, Bakia, and Jones, 2009; Willms, Friesen & Milton, 2009) have focused on the connections among student engagement, the learning environment and teaching practices. These studies have shown that student engagement is related to a number of factors such as: (i) the types of instructional practices teachers enact, (ii) authenticity and complexity of the work students are asked to do (iii) the types of technologies students utilize in their learning and (iv) the amount and type of ongoing feedback students receive while they are learning. This research has established clear correlations between these school related factors present in the learning environment and students' levels of engagement. Their research confirms a finding by the Learning Sciences and Brain Research project sponsored by OECD (2002, 2007). "The more closely the goals of teachers, learners and educational systems are matched, the more effective the learning will be... the more closely this learning is linked to external stimuli of 'real world environment', the more it will engage and stimulate the learner" (OECD, 2007, p. 200). Based on rigorous research on engaged learning and engaged teaching, Friesen (2009) has developed a Teaching Effectiveness Framework to guide high quality design and support of student inquiry learning.

Most of the 23 school jurisdictions involved in the Technology and High School Success initiative indicated that increased student engagement was a goal. Data from several sources, including interviews, survey and classroom observations, were triangulated to determine the extent to which students were engaged in their studies. On the survey, students reported on levels of their engagement in social studies, language arts, mathematics and science classes. During interviews and focus groups, students were asked to comment on the types and nature of tasks they were asked to complete across the curriculum, and the ways that they used technology to connect, communicate and collaborate. Classroom observation data was collected to explore various factors contributing to student engagement (i.e., Instructional Practices, Authenticity and Complexity of Student Work, Assessment For and As Learning, and Academic and Intellectual Engagement). Levels of student engagement in lessons, tasks and activities was gauged at the beginning, middle and end of a lesson by counting the number of students displaying one of four types of behavior:

- Disengagement would include inattention, attending to an alternative activity, off-topic conversation, or misbehaviour.
- Ritualistic Compliance is identified as working on assigned activities without enthusiasm or personal investment. Going through the motions of completing work to avoid conflict or unpleasant consequences.
- Academic engagement is identified by on-task behaviours that signal a serious engagement in class work; these include attentiveness, doing the assigned work, and showing enthusiasm for this work by taking initiative to raise questions, contribute to group activities and help peers.
- Intellectual Engagement refers to an absorbing, creatively energizing focus requiring contemplation, interpretation, understanding, meaning-making and critique which results in a deep, personal commitment to explore and investigate an idea, issue, problem or question for a sustained period of time.

From the perspective of student engagement, the first finding is that the majority of teachers participating in this study are in the early phases of adopting learner-centered instructional strategies; a teacher centered approach to lesson delivery in high school is not strongly correlated with student engagement. The second finding is that teacher activity and student groupings / interaction patterns indicate that the majority of classroom time is devoted to teacher-directed, whole group instruction rather than the student-directed, interactive, peer-to-peer interaction. The third finding is that the majority of participating secondary teachers are in the beginning phases of designing authentically engaging, complex tasks for students – for most high school students, the work they are asked to do is note-taking, answering pre-defined questions and completing chapter and unit tests. The fourth finding from direct classroom observations is that only one-third (30%) of teachers achieved an above average score (i.e., a score of 3 or 4) on each of three measures of intellectual investment, instructional style and authenticity during 2 - 3 time intervals in a lesson.

The most important thing a teacher can do to increase student engagement is to design and support student learning tasks that are meaningful, authentic and challenging (Jacobsen, 2010b). The classroom observation measure of task / activity authenticity indicates that the majority of tasks fall in the artificial versus the real world category – students are often asked to do replication work rather than knowledge building work in each discipline. Our fifth finding is that the majority of participating secondary teachers are in the beginning phases of designing and supporting learning environments that require and support intellectual investment by high school students. The sixth finding is that the majority of participating secondary teachers are well practiced at whole class instruction and guided, whole class discussion. The seventh key finding is that the majority of participating secondary teachers are

in the beginning phases of involving students in assessment and using constructive, timely feedback to improve learning. While we did not test the relationship with standardized achievement testing, there appears to be an over-emphasis on good marks in high school teaching rather than engaged learning and developing deep understanding.

Finally, our eighth finding with regard to student engagement is that more than 50% of high school students exhibit disengagement and ritualistic compliance behaviors during the first third of class time in over 50% of the classrooms we visited. Disengagement and ritualistic compliance behaviors persist into the middle and final thirds of a lesson. Academic engagement was observed in less than 50% of the classrooms we visited, and the percentage of students who were academically engaged dropped as the lesson proceeded. Intellectual engagement was observed in very few classrooms in this study. In the six out of fifty classrooms where intellectual engagement was observed, it was the teacher’s connection to the discipline of study and the design of tasks that enabled students to work together on meaningful and challenging work, along with the appropriate use of technology for collaboration, expression and communication of ideas, and continuous assessment for learning, that were the conditions that led to the greatest amount of change and transformation

Effective Use of Technology To Support and Enhance Student Learning

Though there is a range of information, communication, social and participatory technologies that could be used in the classroom, in the current study, students reported that their teachers tended to use technologies such as interactive whiteboards and videos most frequently. Social and participatory technologies could, potentially, act as social levelers if used more frequently in school – for example, technologies offer students with mobility, hearing and visual challenges a “hand up” while many of these technologies could also be used to help all students to learn better in universally designed learning environments. While most teens are engaged frequently in social networking, the majority of schools and districts tend not to allow students to use social networking in schools. Students report that outside of school they frequently use social networking software (see Table 2).

Table 2: Technology Frequently Used by Students Outside of School (Open-ended survey item)

Comment category	Number of comments
Social networking tools (e.g., Facebook)	286
General internet use	37
Gaming	21
Cell phones and texting	15
Music	13

A majority of students (76%) revealed that when technology was used in the classroom, most often they were watching or listening to the teacher present material to the class while using technology or that they (70%) were working alone with technology. There is an observed disconnect between the technologies that students use outside of the classroom (Table 2), and are comfortable using, and the technologies that they are exposed to in the classroom, such as teacher-controlled interactive whiteboards, multimedia content and streaming video presentations.

An analysis of the interviews with school and district staff suggest schools and districts are in the early stages of providing opportunities for students to make full use of a range of technologies for learning, particularly the technologies that sponsor deeper learning. The analysis of the interviews is supported by the survey results and the classroom observations. Given the widespread need for quality teacher professional development and continuous learning opportunities, coupled with uneven distribution and availability of robust technological infrastructures and networks, many school jurisdictions are not in the position to require that students in secondary schools to be expected to use of a wide range of technologies to develop information, media and technology skills. Given that the technological infrastructure and availability does not yet support ubiquitous and ready access to technology by

students, systemic solutions to getting the training to teachers and the right technologies in the hands of teachers and students must be sought.

Cultivating global citizenship is a key priority to help prepare students for life beyond school. One benefit of technology is it can be used to overcome communication barriers. Student can gain access to professionals and other experts beyond their local communities, and connect with other students across the globe. On the survey, students were asked to indicate how often they used technology to collaborate or communicate with others. Overall, students felt that they did not have many opportunities to collaborate via instructional technology. Almost half (47%) indicated they worked frequently with other students in their classes, but collaboration with students outside of their classroom or their school environment was limited. Students are not using the communication potential of the technology that they have within their classrooms. Though students in the student interviews indicated that they frequently used cell phones and Facebook™ to communicate with friends, these technologies are not used in the classroom. From year one to year two, the reported weekly usage of computers to work with other students in the class increased from 12.6% to 16.1%. The reported weekly usage of computers to work with other students at the school increased from 9.2% to 12.8%. In both of these cases the reported daily usage increased as well, but just a little, which may indicate that the increase was because of students increasing computer use from monthly or never to weekly. It is clear that with regard to appropriate, meaningful and challenging use of technology for intellectual engagement in high school, there is a great deal of room for improvement in many school jurisdictions.

Discussion and Recommendations

As indicated, this paper presents a selective and summarized overview of key findings from an intensive, two-year multiple case study in 23 school jurisdictions in Alberta. A 125 page research report was presented to the Alberta Education Ministry, and will become publicly available in 2012. Overall, researchers documented a few exciting innovations taking place in a small number of high schools. The many teachers who are supporting academically and intellectually engaging work for students are commended for the good work that they are designing for and with students, and for persevering with innovative practices, often in spite of system inertia. Differing levels of technological integration did occur in the various jurisdictions involved in the THSS project, with more ritualistic use of technology in many divisions; the teacher is the main user of the technology and often employs technology using conventional, information delivery approaches with content acquisition testing methods. Given the paucity of meaningful and quality professional learning experiences that teachers are engaged in, and the impoverished technological infrastructures and locked down networks in many high schools, one can empathize with teachers who clearly want to innovate and do more intellectually engaging work with their students and who find themselves unable to actualize their visions and creative ideas with students. Teacher enthusiasm is not the problem; many teachers have a huge appetite for transformational practices and technology infused projects. While a small number of teachers are using technology in innovative, intellectually engaging ways, the majority are not; it is clear that some teachers are simply unable to use technology in the ways that are called for in the 21st century given the large number of barriers (i.e., filtered and locked down networks, insufficient access to technology, little access for student use of technology, inadequate professional learning). Many teachers report that students are now in charge of their own learning and seem more engaged in the process as a result. However, the benefits of technology-enabled learning for students and teachers were clearly not achieved by the majority of schools and school jurisdictions involved in this study. There is a gap between what teachers believe is intellectually engaging work, and what students experience as engaging work.

The majority of participating secondary teachers are well practiced at whole class instruction and guided, whole class discussion and they are the first to admit that they want to make changes to their teaching. The majority of participating teachers are in the beginning phases of involving students in assessment and using constructive, timely feedback to improve learning – there is a clear role here for targeted professional development and learning. With regard to student engagement, more than 50% of high school students exhibit disengagement and ritualistic compliance behaviors during the first third of class time in over 50% of the classrooms we visited. Technology is not being deployed in ways that take advantage of students' skilled and regular use of social and entertainment technologies. Students report the predominant use of technology within their classrooms is watching or listening to the teacher present material to the entire class. It is fairly evident that the technology is not in the hands of high school students in many classrooms; it is just as clear that technology should be in the hands of students.

In just less than 1/4 of the classrooms, students were provided with the opportunity to build 21st century skills such as scientific literacy, social or personal responsibility, the ability to use technology in real world ways, and self-direction. More opportunities must be intentionally designed into secondary learning experiences for the other 75% of students to develop 21st century competencies. In order to understand how to effectively design learning that uses technology to increase student engagement, teachers need high quality professional learning opportunities to engage and learn in similar ways themselves, and they need to subject their learning to peer review and critique (Jacobsen 2010b).

The professional development provided to teachers tended to involve mostly technology training rather than pedagogical design. While some technology training is necessary to help teachers to learn to use technology, it is insufficient to allow teachers to effectively use technology in the classroom. The majority of teachers recognized that incorporating technology into learning requires them to redesign their instructional practices. When asked what their ideal vision of technology use would be, teachers most frequently cited increased access to technology and to professional learning with technology in their subject area. In the teacher survey, and in both the teachers focus groups and the student focus groups, a common concern from both teachers and students was lack of access to the internet because of internet filters and network firewalls.

A key finding from this research is that although technology is increasingly being used in high school, it is still not being used consistently to its fullest potential to facilitate deep understanding, assessment for learning and the levels of intellectual engagement called for by research. While teachers seem to recognize the potential that technology has for learning, there are still a number of barriers that restrict effective and appropriate utilization; school vision and instructional leadership, time for professional dialogue and team planning, pervasive access to technology, and ongoing professional development being the biggest. Teachers want more guidance and support in prioritizing the tasks and obligations required in a successful technological implementation in their subject areas. Access to computers and various technological innovations is frequently blocked due to filtering methods or technological resources are in such short supply that there are simply not enough to provide for each student – i.e., laptops, mobile devices. Further, teachers feel they have not been provided adequate professional development in the use of the various technological tools and resources, nor have they been given either the time or the training in how to integrate technology into their subject area.

There was very little evidence of change within the school districts over the two years towards building their system capacity to advance towards 21st century learning throughout the system. While some districts had components of these key features in place in their districts; the challenge for leaders in these districts remained finding ways to make all the various components cohere into an integrated, unified whole. The researchers stress that a technology initiative implemented over a mere two years is a short time frame to observe the kinds of fundamental changes that are called for when intellectual engagement is the goal. That said, we are now into the second decade of the 21st century – high school students cannot afford to wait while the school systems translate their strategic plans and vision statements about engagement into meaningful, systemic actions and change. School systems across the province have an obligation and responsibility to educate students with the competencies they need to live well within today's world. The researchers emphasize that teachers and administrators in this initiative were committed to doing a good job on behalf of their students. The majority of them indicated they knew engagement was important to student success; however, they were frequently frustrated by what they perceived to be system inertia and seemingly insurmountable barriers.

Educational Importance of the Work

This study increases understanding of the role of technology in the 21st century classroom and understanding of the use of technology for student engagement and success. Findings are significant provincially as well as generally to the field of educational technology for illustrating 21st century learning environments that utilize technology to increase student engagement, school success and high school completion. The information gathered from school visits, classroom observations, surveys and interviews helped to articulate opportunities and benefits of extending innovative learning opportunities to all students and teachers in high schools. Case study research over two years has informed the provincial ministry and education system of educational practices of school administrators, classroom teachers, and the learning of students in technology-enabled high school environments. Study findings clearly identify specific barriers and enabling factors that support the types of technology enabled learning environments being called for in the current research literature on high school learning. This study surfaces both the opportunities and challenges associated with learning, teaching, and leading with

pervasive technologies in the 21st century. This research project also contributes to a growing research literature on the integration of technology for learning in high schools, and of the ways in which teachers gain technological pedagogical content knowledge (Koehler & Mishra, 2008; Mishra & Koehler, 2006).

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