iPads on Practicum: Perspective of a Student-Teacher

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Abstract: Educators are embracing technology as a key to transforming learning for the 21st century. As the 21st century learning movement emphasizes the development of skills that are seen as uniquely relevant to the modern world, in the educational community, many are looking to technology, such as tablets, as a tool to modernizing classrooms. This research presents a case study of a participatory action research project, where participants provide input into the research process, examining the experiences of a secondary education level student-teacher implementing iPads during practicum. For two weeks, the student teacher integrated a set of 22 iPads into a grade ten Media Literacy unit. Qualitative data from the teacher's daily blog and a post-practicum interview revealed six main themes in two categories: Teacher Impacts (Planning and Curricular Design, Delivery, Practicum Experience) and Student Impacts (Classroom, Learning Outcomes, Learning Experience). While generalizations to other English Language Arts (ELA) classes cannot be made, the results of this pilot study suggest that tablet technology has the potential to aid the transition to 21st century learning at the secondary level, and warrants further research and attention.

Key Terms: iPads; mobile devices; tablet technology; educational technology; practicum; teacher education; English language arts; media literacy; 21st century learning; secondary education; action research

Introduction

Educators and administrators are embracing technology as a key to transforming learning for the 21st century (Leu et. al, 2004; British Columbia Ministry of Education 2013). The 21st century learning movement emphasizes the development of skills that are seen as uniquely relevant to the modern world: learning and innovation skills (e.g. creativity, collaboration); information, media, and technology skills (such as media literacy); and life and career skills (e.g. adaptability, social and cross-

cultural skills) (Partnership for 21st Century Skills). Given the movement's apparent emphasis on enabling the development of this diverse set of knowledge, skills and abilities in students, technology is often identified as a central pillar of the 21st century movement, based on its ability to facilitate desired student outcomes (BCMOE, 2012). However, the emphasis on the use of educational technology as a central tenant in the 21st century movement is problematic because "the academic study of educational technology has grown to be dominated by an (often abstracted) interest in the processes of how people can learn with digital technology [rather than] how digital technologies are actually being used ... in 'real-world' educational settings" (Selwyn, 2010; p.66). Further, many claims made in the extant literature are untenable because educational technology research in particular often serves as a "flag of convenience for a loose assortment of technology-minded psychologists, pedagogy experts, math and science educators, computer scientists, systems developers, and the like" rather than as a subject of study by researchers interested in developing educational technology as a distinct field (Selwyn, 2010, p.65). Such is the case with public proponents of handheld and mobile technologies: popular media is replete with claims that these technologies can help educators to teach 21st century skills (e.g., Discovery Channel, 2013; Subramanian, 2012; Teffer, 2013). However, there is a need to gain "a full sense of how and why educational technologies are being used in the ways that they are [and are] therefore underpinned by understandings of how these technologies are socially constructed, shaped and negotiated by a range of actors and interests" (Selwyn, 2010, p. 69). For example, case studies of actual use of handheld and mobile technologies in the classroom context reveal that such innovations may assist in a greater variety of teaching and learning processes than currently being investigated (e.g., Swan, van t'Hooft, Kratcoski & Unger, 2005).

Handheld technology has the potential capability to bring a renewed life to established instructional approaches and concrete reality to emerging innovations (Larson, 2010). Some of the suggested benefits of mobile technologies in education include their: a) low cost and accessibility; b) requirement for substantially less infrastructure and electricity; c) easy access to supplemental resources for schools that lack educational resources; d) additional support for under performing students; and e) support of literacy development (Kim et al., 2011, p. 466). One particularly important addition to this list is that mobile technology affords differentiation and personalization of instruction. For example, studies

report that tablet technology, such as the iPad (Apple, Inc., 2013a), may be used at any level of education as individualized "control center[s] of personal knowledge management" and as teacher-controlled collaborative tools in targeted classroom exercises (Ludwig & Mayrberger, 2012, p. 2184). In the context of literacy and English Language Arts (ELA), studies using tablet technology often explore the device's ability to enhance student interaction with texts. Literacy development involves "readers mak[ing] sense of reading experiences as they apply, reorganize, revisit, or extend encounters with text and personal experience" (Larson, 2010, p. 16). The introduction of new technologies for reading supports the reading experience, especially in the use of new tools available through the digital text format (Eagleton & Dobler, 2007). Further, preliminary findings suggest that with the use of personal handheld and mobile devices, students exhibit greater self-monitoring, problem solving, engagement, interactivity, student-led inquiry, and personal time-management (Ludwig & Mayrberger, 2012; Larson, 2010; Alyahya & Gall, 2012; Reid & Ostashewski, 2011). However, research thus far represents mostly 1:1 tablet to student ratios, and reported benefits are related to this personal organizational and research device focus (Ludwig & Mayrberger, 2012; Alyahya & Gall, 2012). Since many schools and students may not be able to afford a 1:1 tablet program, further research is needed to explore the utility and the social implications of tablets used as shared classroom tools.

Al Lily (2013) relates that, "Given the technologically-shaped nature of society, the planning and development process of educational technologies should be more participatory, with all different categories of actors being involved and in turn able to express feelings, articulate needs, and negotiate interests" (p. 42). With regard to student-teachers' experiences, previous research has found that the skill and attitude of the teacher is a predictor of the technology implementation's success (Bitner & Bitner, 2002; Fedora, 2012). However, rigorous research addressing specifically how classroom interactions may be affected by technology implementation is currently deficient (Alyahya & Gall, 2012). With this view in mind, this research presents the first in a series of case studies of a larger participatory action research project, where participants provide input into the research process, examining the experiences of a student-teacher implementing iPads during professional placement (practicum). The research reported in this article is a case study focusing specifically on the experiences of a student-teacher charged with implementing tablet technology for the first time while on professional placement (practicum) in a high-school ELA classroom. The

larger study in which this work is situated aims to identify challenges and suggest general strategies for implementation of tablet and mobile technologies in the K-12 classroom. As a result, this research project will provide evidence useful for the decision making necessary for current teachers, administrators, policy makers and to faculties of education charged with educating student-teachers on the use of handheld and mobile technologies in the classroom.

Research Questions

This research seeks to add to the body of knowledge on the reality of the implementation challenges and benefits of handheld and mobile technologies in the K-12 classroom context as encountered by a student-teacher. This qualitative research study is focused around a model of participatory action research where the subject of the study, the student-teacher, acts as a participant in the research process (specifically in reflection, data collection and action). The case study reported in this article aims to illustrate the following:

1. What are a student-teachers' experiences with integrating new technologies (iPads) on practicum (based on personal reflection in a private blog)?
2. What kinds of evidence (data collection) does the student-teacher provide in explaining the variations in implementation of new technologies (iPads) into teaching and learning?
3. What kinds of instructional adaptations (actions) does the student-teacher make as the process of integrating new technologies (iPads) changes while on practicum?

Context

The study took place in a large, middle-income, urban high school in Western Canada. The participating Grade 10 English class was composed of 4 girls and 23 boys, two of whom had Individualized Education Plans (or IEP's, alterations to the provincial curriculum or support requirements for students with documented special needs) related to reading and writing. Technology already played a role in day-to-day class activities; the room was equipped with three desktop computers (with Internet access), an overhead projector, a DVD player, and a document camera – all of which were used frequently by the regular (mentor) teacher. No province- or district-wide policy or procedures for classroom tablet or mobile device implementation had been established, so planning and designing for

implementation is entirely in the hands of individual administrators and educators. For the duration of this project, the student-teacher was provided with a set of 22 iPads available for classroom use.

Methodology

This set of 22 iPads was used for 7 of the 8 days they were available, and were incorporated into the majority of each class during a grade 10 Media Literacy Unit. Applications (apps) were chosen based on educational potential and zero cost. Planning was carried out entirely by the student-teacher; sometimes an interesting app inspired an activity, and other times the student-teacher sought out an app to fit an activity already in mind. Data was collected through an audio-recorded interview and a blog maintained by the student-teacher throughout the classroom implementation. The blog was private, accessible only to the student-teacher and members of the research team. The study approached the data with an interpretive phenomenological analysis, which is an inductive ('bottom up', rather than 'top down') exploration of phenomenon (occurrences) which treats participants as experts in assigning significance to and interpreting their own lived experiences; the emphasis on everyday experiences, and the participants' own contribution to the hermeneutic (interpretive) conversation fit well with the case study's intention to establish broad and experience-based evidence of tablet implementation challenges and benefits in service of future research (Carpenter & Suto, 2008; Reid, Flowers & Larkin, 2005; Smith, Flowers & Larkin, 2005). A fine grain translation of colloquial reflections into more objective statements categorized by key words and concepts (e.g. motivation, timing, peer-teaching, complexity) resulted in 160 qualitative data points from the interview and 223 from the blog which in turn suggested the emergent themes and categories described below.

Results

The thematic analysis of the student-teacher's blog and post-practicum interview resulted in six themes clarified into two categories: Impacts on Teacher Experiences (planning and curricular design, delivery, practicum experience), and Impacts on Student Experiences (classroom community, learning outcomes, learning experience). Where necessary, direct quotations from the student-teacher are used to illustrate the relevant themes.

Impacts on Teacher Experiences

Planning and Curricular Design

Reflecting on the experience, the student-teacher felt that iPads could invigorate and individualize curriculum development for English Language Arts and help build literacy skills. The student-teacher noted the following:

> With the Internet that [students] experience these days, everything's personalized and at their fingertips, and I want them to feel the same way about English, and see how [the subject] relates to absolutely everything…[I like the] thematic link between iPad use and what you want to do in an English classroom. (Student-Teacher, interview, December 4, 2012).

The student-teacher appreciated how personal Internet connectivity brought new content to classic tasks, and felt this quick and flexible access to current information supported the core skills specific to ELA curricula. Reflecting further on the ways tablet technology supports ELA goals, the student-teacher commented that "English is trying to connect so much to the outside world," and tablets can help students to acknowledge the subject's connection with lived experience, and so to overcome the physical and mental isolation of physical classrooms (Student-Teacher, interview, Dec. 4, 2012). Additionally, the iPads were integral in assignment designs that gave students greater control over their progression through content. In this way iPads, more than other technologies, allowed the teacher to achieve process learning goals (e.g. student ownership of learning) in the student-teacher's classroom.

The presence of iPads influenced the student-teacher's planning workload, organization of the physical space, and the timing and content of lessons. Extra planning time was required to incorporate iPads (learning new technology; preloading multimedia content onto iPads to save time and confusion during in-class assignments; ensuring proper device configuration). For example, the student-teacher's blog noted two low-performing students chose to watch a video for station-based work, but failed to read the accompanying instructions that specified the relevant portion of the clip. Further, among many reflective adaptations the teacher recorded, the student-teacher specified a need to cut and tailor online resources to avoid frustrating at-risk students. Accessing the Internet opens curricular doors (e.g. students source own media examples and save to a shared space) (Student-Teacher, blog, November 13, 2012); however, as the student-teacher pointed out, there was a need to spend time altering online resources to suit the needs of the class, where accessing online resources

could also require an increased planning investment as teachers carefully source and prepare multi-media materials.

When the teacher planned and arranged desk layout or seating plans with iPad activities in mind, the student-teacher was able to troubleshoot problems before they arose (space to move during mobile learning; good iPad partnerships based on proximity; reduced glare from overhead lights), and free the student-teacher's in-class energies for teaching and troubleshooting device issues. Also important was the layout of the digital space on iPads, which could increase or decrease distraction and confusion.

A well-planned sequence of events resulted in greater classroom structure, which increased self-advocacy (especially in high-performing students). Low-structure lesson plans often inspired insular iPad use from all students. Student comprehension and cooperation improved when lesson plans focused on only one application, and when additional time was budgeted for learning basic application use before content was introduced. Instructions that students could immediately understand and enact at the beginning of lessons set a focused and efficacious classroom tone.

Delivery

iPads were most effective when used in conjunction with traditional discussion- and paper-based assignments. The role of routines was represented strongly; well-established routines streamlined transitions and regulated energy and emotion, ultimately leading to a more effective and productive classroom. These positive effects held across novel physical contexts and helped to ensure the security of the iPads (i.e. safe transport and responsible handling). Device distribution routines presented a particular problem, as they impacted the class pacing and student activity pairings. When distribution was slow, students involved themselves in off-task and social activities from which it was difficult to disengage. Attempts to speed distribution often compromised the composition of ideal groups, and potentially the security of the devices.

In many ways the classroom functioned as it would without tablet technology: students completed tasks independently (e.g. mindmaps using SimpleMind) giving the teacher a chance to circulate and provide individual instruction (often troubleshooting device difficulties). Modeling new skills and knowledge (such as a new app's functionality), providing clear instructions with accompanying visual aids, and checking for comprehension all played important roles in the delivery's success (i.e., it was the teacher's perception that the students comprehended instructions,

content, and process, and were able to participate and gain knowledge or skills). As with other innovations, time is needed to establish familiarity with new routines and skills. The difference is in the types of in-class troubleshooting that a teacher can expect (technical as well as academic), the forms of information delivery now available to the teacher (e.g. instruction stored in an app that direct students to further online content), and the behavioural and emotional management techniques required for positive and productive guidance of the class's new-found excitement. For example, when the teacher passed out one iPad, rather than all the iPads, and asked a single student to check the log-in information, the student-teacher modeled a calm and controlled approach that set the standard and tone for the rest of the day. In asking the class to focus on the one student's progress, the student-teacher created a community investment in peer success (others even began to chant his name), and at the same time created a pause for the student-teacher to regulate personally-experienced emotions regarding the difficult distribution process.

Classroom management challenges specific to the iPad include: monitoring screen content and assessing group comprehension of multi-step oral instructions; time required to address a high volume of troubleshooting issues (and subsequent student distraction and disengagement) if students lack problem-solving skills; and the need for back-up plans and adaptive teacher reactions in the face of technology bugs. Especially in the face of technical bugs, the teacher fell back on more familiar methods, which broke the class flow and limited the effectiveness of the technology's use.

Practicum Experience

The student-teacher was motivated to participate in this research by practical factors (the supportive practicum setting; advocates who could ensure the iPads' availability; the preparatory time afforded to student-teachers for planning) and professional development goals. As a beginning practitioner still developing Kounin's (1977) "with-it-ness" (teacher ability to be aware of all factors and events in the classroom) and routines for multi-tasking, the student-teacher was further challenged by the dual roles of researcher and instructor. Carefully distinguishing between "not useful" and "did not work in my class" helped to empirically organize thoughts and emotional responses regarding iPad experiences. The student-teacher reported both positive and negative emotions, with mixed effects; for example, excitement drove the student-teacher to experiment with many iPad uses, to the extent that lessons became fragmentary for students.

Reflecting on the student experience, the student-teacher felt that "it wasn't consistent every day because I was doing something different every day," which in turn was a result of the student-teacher's wanting to "try so many different things" (Student-Teacher, interview, December 4, 2012). Clearly emotion regulation will be an important practice for teachers, as well as students, when new devices shake up the routine classroom environment.

The preparation provided by the university post-degree program was not seen as adequate because of its focus on strategies (theory rather than practical knowledge and skills), its reliance on paper-based activities, and the lack of integration between the subject and technology courses. The student teacher would "have loved to see more technology talk in [university-based] methods courses, because we have the time [and are] with people who are like-minded and trying to teach the same subject" (Student-Teacher, interview, December 4, 2012). It was also noted that "there's a huge learning curve for the basics [of iPad use] that [one] could get past very quickly in a course" (Student-Teacher, interview, December 4, 2012).

After implementing iPads in a supported practicum setting, the student-teacher learned the basics of classroom technology implementation, and felt more confident, comfortable, and likely to use similar technology in future classrooms. This provides support for the adoption of a hands-on professional development approach in teacher-education programs; if "teachers are able to experience a more personalized approach to learning that incorporates contemporary technologies and makes authentic connections to their practice, they are more likely to take up a similar approach with their students" (Ostashewski & Reid, 2012, p. 1824). This is especially true given the unique technical, classroom management, and emotional regulatory challenges of a classroom using tablets, and the adaptive teacher reactions needed to address them.

Impact on Student Experiences

Classroom Community

The student-teacher noted that the introduction of iPads increased the sense of community in the classroom, while the shared nature of the tool facilitated peer-to-peer teaching, especially in low-performing but tech-savvy IEP students. Groups formed based on friendships or working relationships: some groups were comprised of motivated students who abandoned their less motivated partners to find others who would challenge and help them at their level; some partnerships formed out of friendship,

where one member helped and instructed a less able friend. Allowing groups to form around the iPads encouraged some students to achieve more, but left those on the outside with no options for completing the work. Students who felt socially or academically excluded from tasks – or who were paired with particularly dominant personalities – disengaged and lost their sense of personal accountability.

The stimulation and excitement of a new delivery format could sometimes be harnessed into focused energy by the students' desire to use and be trusted with the iPads; other times the classroom energy rose to levels not conducive to learning. Overall, iPads served as a catalyst for pre-existing patterns of focused and unfocused energy, so that each was more extreme. Student attitudes individually and as a collective were positively correlated with their approach to and care of the iPad. Overall, the iPads inspired positive group interactions and contributed to a positive classroom tone (Student-Teacher, blog, November 13, 2012).

A small percentage of students approached the iPads with misgivings; these instances were dealt with effectively using one-on-one needs assessments. Improved attitudes led to improved focus on tasks; for example, "student moods seem improved, as evidenced by attention to [the quick response code] paper and to [the] iPad screen, as well as tone of voice" after student teacher trouble-shooting interventions (Student-Teacher, blog, November 21, 2012).

The presence of iPads elicited a complex desire for possession that did not always translate to focused work, and resulted in negative affect when iPads were removed. As a group, students were emotionally invested in the experience, acknowledging the iPad as a special privilege, following rules for care, and expressing a desire for 1:1 ratios. Over the course of the classroom implementation, the teacher noticed an increasingly reduced rate of student absences. In a class where absenteeism was an ongoing challenge, the increased attendance and participation of generally low-performing students was viewed as significant from the student-teacher's perspective.

Learning Outcomes

Though not tested directly, the teacher's anecdotal evidence suggests both positive and negative impacts on student learning outcomes. Confusion regarding application use (e.g., the ShowMe app was less intuitive than expected), and how the iPad content supported task completion (i.e., task interpretation) was frequently mentioned as a major roadblock. As others

have found (Robinson, 2012), the iPads proved to be a distraction, facilitating off-task behaviours during task instructions, transition times, and group projects. Listening to music, downloading games, and the app 'Photobooth' were the most common distracters. Because of the device's connectivity, individual distractions had significant ripple effects in class-wide focus, and the online sharing of photos posed a potential privacy and security risk. As the teacher's understanding of iPad instruction evolved, the student-teacher found that confusion – and therefore distraction and off-task behaviour – could be reduced by beginning lessons with structured control in quick, focused device tutorials. As noted above, iPad application use itself must be thought of as a learning objective before it can become a vehicle for production.

Given a calm classroom tone and a scaffolded instructional approach, students successfully used iPads to record their thinking processes alongside final products, to digitize usual tasks (e.g. reading a text) and to complete innovative tasks, such as locating digital instructions and completing an app-based activity. The personalization of pace and content access afforded by iPads allowed for student self-guided time to form their own thoughts about collections of information. Groups used iPads collaboratively as a tool for research. Generally low-performing individuals were able to access multi-media materials and tech-enabled response forms that inspired a greater quality and frequency of responses. The student-teacher felt that this was due to the student's familiarity with the digital response options.

Learning Experience

Similarly, iPads had some positive impacts on students' experiences during learning while also presenting challenges to the developing learner. Student interest spurred self-advocacy and engagement. Students enjoyed a greater variety of task formats (including interactive, educational games), greater personalization (i.e. content and response format was more flexible than in a classroom without Internet and tablet access), and increased choice. The iPads allowed students to move physically in the classroom, and so to feel their progression through a task in a physically embodied way. Self-guided and exploratory tasks created space for students to develop deeper understandings of content and a new sense of ownership over the process. However, the increased sense of ownership observed was not consistent across students. Rather, the iPad magnified pre-existing conditions and personalities. During a task with greater freedom of movement and choice, students struggled with sequencing and decision-making, co-regulating

learning and teamwork, and narrowing focus when given a large amount of information. Though iPad partnerships initially posed social and accountability problems, students gradually improved their ability to share responsibilities and privileges.

Sign-out routines and an interest in maintaining the privilege of participation translated to a greater sense of responsibility and unforeseen instances of co-regulation of behaviour. Because there were not enough iPads for a 1:1 ratio, all activities involved some level of sharing, and therefore added a social aspect to all tasks. While in many cases this encouraged necessary development of collaborative skills, it sometimes left students out. For example, during a task with greater choice and freedom of movement within the classroom, students formed groups based on social and academic preferences, rather than assigned pairings. If a student did not match the group criteria, s/he separated and disengaged. Finally, novel tasks requiring a social risk (e.g., voice recordings) were affected by proximity to other students. Therefore, the socio-physical settings must be considered when planning the introduction of new technology (Larson, 2010).

Discussion

Classrooms using tablet technology need not be fully digitized, and in fact this study indicates that, in group contexts, tablets are best used as strategically dictated by activity demands. They can inspire critical thinking about online content, arenas where digital natives work and play but seldom learn. Futhermore, tablets facilitate individual choice, while maintaining lesson structure. Nonetheless, the application of tablet technology as a learning tool is dependent on the length of the classroom implementation (influences familiarity with device, and number of apps covered), the presence of supporting skills and technologies, and the goodness-of-fit between the task and the tool (e.g. group work vs. individual work). For example, visual cues played a large role in the students learning iPad use – a consideration that necessitates acquiring other supportive technology, such as document readers. If tablets are to be implemented most effectively, a teacher plan, supported by administration, must be in place.

For all its curricular advantages, a large amount of time goes into learning a new technology and adjusting lesson plans to make use of the technology's capacity. Lesson plans incorporating tablets should emphasize simplicity, structure, careful time management, and clear learning objectives. The complexity that resulted from layering iPad app use over content goals presented a significant roadblock to student learning. The

teacher often assumed student proficiency, but when polled, only 3 out of 27 students indicated preexisting familiarity with a popular program. When planning application use, teachers cannot assume technical knowledge, and must move gradually from goals of showing technical proficiency, to absorbing new information, to generating original responses. As with other studies that found "more success…after the class was comfortable with the process to follow with creation and sharing with the iPads," routines were emphasized as key to integration (Reid & Ostashewski, 2011b).

One of the most popular aspects of tablets is their readily customizable format, and their ability to personalize learning experiences (Reid & Ostashewski, 2011a). Using tablets allowed students to have more control over the pace and order of content delivery, rather than having it dictated by a teacher at the front of the classroom. The tablets, therefore, facilitated a diversity of thought in the classroom. Students could engage with content in different ways and at different rates because the tablets gave the student-teacher a means of and a vehicle for transferring control (BCTF Principles of Learning as in Stokes, 2005). The ownership that manifested itself in the classroom was a social goal in the teacher's plans, but was not controlled by the student-teacher's hand. The student-teacher noted that ownership didn't necessarily come up in the ways or moments that were expected, but did manifest itself in serendipitous and unplanned incidents (Student-Teacher, interview, December 4, 2012). In a generally low-motivation class, this spontaneous development provides compelling evidence for the effectiveness of student-centered learning based on engagement. The iPad was often integral to the development of positive, personal learning qualities, as evidenced by the more highly-motivated students who gravitated toward each other in low-structure tasks and connected over mutual interest in learning the new tool's use.

The social context of iPads, both in and outside of the classroom, must be considered when planning classroom implementations. Smart devices are all around us, and thus already have strong psychological connections with leisure rather than learning. The motivation - especially as manifested in problem-solving and persistence - that students exhibit when learning games on smart devices cannot be assumed to automatically transfer to learning new applications and uses for education. More than simply disengaging from prescribed learning objectives, students' off-task tablet usage could verge on privacy and security risks for their classmates (e.g. posting photos without permission or appropriate privacy settings). Students being given iPads for classroom use would benefit from an Internet safety

and security seminar. Finally, social and emotional conditions played roles in engagement, persistence, and personal responsibility. Planning for the socio-physical factors of the classroom must consider the interaction between physical proximity and personal social risk, while monitoring the effect of large or small spaces on group coherence.

The beginning teacher's investment in learning the technology and revising lessons took additional effort, but resulted in a rich learning experience. Teacher education programs might support such experiences by offering hands-on and technology-focused courses, especially those that key students into the unique challenges of being a new teacher or educational researcher.

Limitations and Future Directions

As a case study, the results of this experience are not directly transferable to other contexts; however, the unique successes point to the potential of tablets as a flexible tool applied to context-specific issues by creative educators in the secondary classroom. Clearly useful in challenging older and upper-level students (e.g., Robinson, 2012; Alyahya & Gall, 2012), tablet technology also shows potential to support independent scaffolding in under-performing individuals who would normally require much of the teacher's in-class attention (e.g., Larson, 2010). In this study, low-performing students were motivated to attend and participate in class and were more likely to seek help regarding content and device use than they were to ask questions regarding paper-based assignments. While their growing involvement was exciting, it quickly became clear that these students depended on the teacher for problem-solving and did not have well-developed classroom behaviour strategies (e.g., how to ask a question without disrupting others). Contrary to observed student dependencies in the current study, Reid & Ostashewski (2011a) found increased independence in school-aged student problem-solving, and a shared responsibility for technical competence between teachers and students when tablets were introduced. Regarding student readiness for technology integration, Ludwig & Mayrberger (2012) point to self-monitoring and self-determination as paramount in the list of prerequisite competencies. In this study, the need for independently motivated problem-solving was emphasized across all themes. However, further research is needed to answer the question: what skills best support tablet technology integration and learning with tablets (problem solving; self-regulated learning interventions; device-specific tutorials)?

Conclusion

In general, the student-teacher's data indicates that integrating tablet technology was a positive learning experience, both for the teacher and the students. The students exhibited a larger number of on-task behaviours, and a more engaged attitude, especially when given the chance to move physically in the room and to choose the pace and format of information delivery. These factors – mobility, multiple formats, and personalization of pace – are uniquely facilitated by tablet technology. Through this research, the student-teacher gained hands-on experience with a cutting-edge example of technology in the classroom. The teacher's comfort with the technology and confidence in using it are powerful arguments for integrating technology into teacher education programs.

Integrating new devices requires commitment and critical thought. Students' and teachers' abilities both improve with experience, and time must be allowed for strategic and thoughtful applications to show their true worth. The main factors influencing successful classroom implementation were student demographics (readiness, mindset, motivation, and technology & learning skills) and teacher mindset (device expertise, planning, and delivery). Though the teacher had already been using various forms of technology in the classroom, the student-teacher felt that the tablets uniquely allowed the student-teacher' to encourage students to be personally responsible and excited about their own learning; the format literally put flexible, multi-media information and learning opportunities into each student's hands. While tablet technology can facilitate student choice, engagement, energy, and collaboration, teachers must plan groups and lessons according to the tenants of good practice for any teaching, regardless of the available technology.

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Acknowledgements

This research was completed under the direct supervision of Drs. Jillianne Code and Valerie Irvine and was supported by the Jamie Cassels Undergraduate Research Award through the Office of the Vice President Academic and the Learning and Teaching Centre at the University of Victoria. The authors would like to thank Apple Canada, Inc., for their support for loaning the iPad hardware required to complete this research. Finally, the authors would like to thank the students, teachers, staff and administrators involved in this project who without this work would not be possible.