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## A Study of Student and Instructor Perceptions of Tablet PCs in Higher Education contexts

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### Abstract

*The advent of the tablet device has fundamentally changed the instructor's ability to mobilize the student's learning environment, freeing them from the limitations of laptop based features, to expanding interactions and collaboration with other students. While other smart devices have enhanced mobility, the tablet computer with its true portability, long-battery life and haptic capabilities has made the mobile classroom practical in functionality and versatility. Despite their popularity with students and faculty, usability studies concerning mobile tablet devices in post-secondary environments are lacking. This study is aimed at determining user perceptions and usability of Microsoft Surface Pro tablets in the classrooms of a Canadian university by both students and faculty. The use of the tablet was examined as a tool to move students from the typical technology infused classroom using laptops into a mobile, engaging, learning environment. Overall, participants found the general computing capabilities and portability of tablets impressive, particularly for note taking and classroom engagement. This paper will discuss the benefits, problems, and possible solutions to teaching and learning utilizing tablets in the classroom. This study represents an initial starting point to understand the impact of tablet devices in higher education learning environments.*

*Keywords:* tablet-based learning, post-secondary education, digital classroom

There are an increasing number of universities and colleges implementing mobile learning initiatives in the form of requiring students to have laptops for learning. These initiatives are motivated by increased market demands for graduates who are technologically literate, and have strong competencies using computers (Rola, 2002). There is however, little research on how the students, the primary users of technology investments, feel about the design and implementation of tablet PCs in their programs of study. Currently, most technology enhanced learning initiatives are only for specific programs or levels of study (Anderson, 2005). A number of qualitative studies have described the implementation of mobile learning programs at various institutions (Bohy, 2004; Brown-Martin, 2010; Cochrane, Narayan and Oldfield, 2013). The majority of these studies have been focused on liberal arts applications (Brown-Martin, 2010; Eccelsfield and Garnett, 2010) although a few have analyzed a specific course or year of study in engineering or computer science (Fried, 2006). A number of studies have also examined how students are using the laptops for learning in terms of enumerating the use of basic software applications (Elwood, Changchit and Cutshall, 2006). The learning and problem solving ability of students appears to increase with the integration of tablets in their curriculum, but if students are not actively engaged in using their tablets during the class then they can become distractions and inhibit high quality learning (Finn and Inman, 2004).

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For the purposes of our study, it is important to distinguish the difference between laptop personal computers and tablet devices.

Tablet PCs are mobile computers that utilize large touchscreens as user-input devices to be operated by a stylus, pen, or fingertip (Fischman and Keller, 2011). Operating systems such as Android, Apple iOS, Microsoft Windows or Linux are common platforms. Initial forms of tablet PCs were developed in the early 1990s, however early devices were never able to convince users nor administrators due to their bulky form factor, short battery life, and incompatible user interface (Fischman and Keller, 2011). The launch of Apple's iPad in 2009 brought a new generation of tablet devices that balanced computing power with minimal form factor, and utilized a large but easily manageable touchscreen display combined with a long battery life and a heavily customizable operating system (Harman, 2012). By targeting a limited number of usage scenarios, such as communication via text and voice, internet applications, and multi-media capabilities, the iPad was able to go beyond any previous generation of tablet PCs. The combination of these hardware and software features are largely due to technology miniaturization, and lower cost manufacturing has led to a broad adoption of tablet devices by consumers and organizations (Harmon, 2012). Students have expressed a belief that personal computers are important for learning, but that the laptop mobile learning programs do not offer sufficient value for their investments.

Among mobile devices, tablets have been described as “a game-changer” because they offer similar tools to smartphones and laptops alongside a growing range of learning tools (Eccelsfield and Garnett, 2010). They are effectively a blend of smartphone and laptop computer features, and can be customised for educational or personal use as a result of many multi-platform applications. Although companies such as Motorola, Samsung and Sony have entered the tablet market, Apple's iPad has emerged as the “category-defining blockbuster,” to the extent that “despite policies that ban mobile devices in most K-12 schools, the iPad is changing the conversations on campuses” (Eccelsfield and Garnett, 2010). Tablets also provide additional functionality for digital note taking, annotation of work, and drawing. The unique handwriting and drawing capabilities of the tablet device, and its associated applications, allows instructors to provide augmented notes to students before, during, and after each class. The use of tablets also influences the way instructors behave within their classes, allowing for additional types of interactions between students and themselves. Further studies, such as the one presented in this paper, regarding innovative usage of tablet devices, need to be pursued to follow students and faculty as they acquire new skills, and greater confidence when teaching and learning with these devices. It is our goal to determine how the use of tablets will alter the existing understanding of the effect of integrating technology into teaching pedagogy.

### **Research questions**

Traditionally, the knowledge and skills of a graduate in a specific field were sufficient to secure a position in an organization. However, in today's technology-enabled economy, graduates must also be fully competent with

the software applications being used so that they can effectively contribute to the hiring organization and its strategic objectives. A growing trend, especially evident in high-tech jobs, is the demand for workers with a combination of technical training, formal education and “soft” skills. Data has shown that one-on-one use of mobile or portable technology by students, in and out of school, who spend 50% to 70% of their day on electronic devices can improve academic performance (Gawełek, Spataro and Komarny, 2011). As personal mobile technologies for learning become more widespread, studies are starting to show evidence of the value of incorporating mobile devices in teaching and learning (Hamilton and Robertson, 2010), and also substantial issues, including conflicts between informal learning with personal devices and traditional classroom education (Harmon, 2012).

Traditional instructional methods are beginning to fade as post-secondary education expands outside of the classroom, and the rapid growth of tablets is blurring the lines between personal use and instructional use (Haydon, Hawkins, et al., 2012). In a recent study evaluating the preference of using tablets over traditional classroom tools, 64% of students surveyed preferred utilizing a tablet device to complete their coursework (Hutchison and Reinking, 2011). A common point of critique of the traditional lecture-based, instructor-centric learning model is that it does not engage students effectively nor provide authentic assessment (Gawełek, et al., 2011; Hamilton and Robertson, 2010). Educators believe that simply bringing technology to the classroom will improve this learning process and skill development (Harmon, 2012). Despite this reasoning, few technological tools have been fully integrated into higher education curricula and classroom-based learning successfully. Tablets could be an ideal tool to enhance the learning process, the interaction of students among their peers, and strengthen interactions between students and instructors. Where the use of tablet devices in educational settings have been discussed in the literature, it has been primarily descriptive. Some articles describe a variety of uses by higher education faculty members including note-taking (Harmon, 2012), writing comments on student assignments (Garnett, 2010), sketching complex math formulae and in-class group work (Haydon, et al., 2012). Additionally, the literature describes faculty members creating handwritten instructional materials using tablet specific programs such as MS Journal or OneNote spontaneously during lectures or tutorials where “just-in-time” presentations were used in response to inquiries from students (Hutchison and Reinking, 2011).

In this study we propose to investigate the following research questions: (1) In what ways can the use of tablet affordances improve overall learning experiences for students? (2) How do students’ use tablets for course work? As another resource, practice tool, or both? (3) What advantages (barriers) exist for implementation in a large-scale, faculty-wide initiative? (4) Where are the gaps in institutional support for instructors looking to integrate tablets in their normal teaching practices? In such a new field, this research is an important way of generating insights into teacher and student views, not only on engagement and motivation, but on how mobile devices are used in

practice to support teaching and learning, and what users perceive as their educational benefits and limitations.

### **Literature Review**

Tablet PCs used for education have become widespread globally and the tablet PC has the potential to alter the educational process. Tablets provide new ways to interact with computing devices which benefits teachers and students looking to augment traditional classroom learning (Dündar & Akçayır, 2012). Many researchers have suggested the use of tablets as a supportive tool in classrooms, however there have been few studies focusing on the perceptions and attitudes of students and instructors (Dündar & Akçayır, 2012; Galligan, Loch, McDonald, & Taylor, 2010; Loch & Donovan, 2006; Olivier, 2005). Integrating tablets into classroom instruction ultimately focuses on students' learning as well as the effectiveness of teacher's instructional methods. In order to be advantageous for classroom instruction, a technological innovation such as tablet PCs needs to be accepted by teachers and students alike. For example, Bürg and Mandl (2004) found that the integration of technology in education will often fail due to a lack of acceptance by its potential users. Most studies so far have focused on the Apple iPad, which was the first and most popular tablet since it came to market in 2009 (Laurillard, 2012).

However, the literature is full of examples of comparative educational technology studies that inevitably illustrate the “no significant difference” phenomena between the introduction of new educational technologies and traditional pedagogical approaches (Haydon, et al., 2012). The evidence suggests that this is due to an accompanying resistance to pedagogical change, rather than leveraging the unique affordances of new technologies (Lim, 1999), and that educators merely replicate old pedagogies on new devices (MacDougall, Müldner and Tomek, 2004). Currently, tablet research projects in higher education environments are driven by the incredible popularity of this new type of device. What is clear from the literature is that the integration of tablets in a post-secondary setting is not guaranteed to be successful. Studies find that most students would not adopt a tablet device voluntarily; rather, students must see a “need” for sustained interaction with the device (Mang and Wardley, 2012). The key to successfully adopting tablets is to ensure that the devices are integrated into both the academic and the social aspects of the course (Franklin, 2012).

One example is an iPad study conducted at Pepperdine University found that tablets improved student-to-instructor collaboration among calculus students where they were able to work together and share screen images, while solving mathematical problems (Weider, 2011). By comparison, Norris & Soloway (2012) also found that students who had a higher proficiency with Information Technology in general were quicker to adopt the tablet as both a learning and personal tool. It is perceived that the younger generation of learners not only prefers to learn using new technology, but are now demanding technology-mediated classes (Ostashewski and Reid, 2009). The 2010 Step Forward pilot trial of iPads across nine academic subjects at Trinity College, at the University of Melbourne, found that they were “effective,

durable, reliable and achieved their educational aims of going further, faster and with more fun” (Jennings, et al., 2010). This led to the rollout of iPads to the entire pilot group of institutions the following year, though the authors cautioned that they were not a replacement for desktop or laptop computers, rather an ‘enhancement device,’ a point echoed elsewhere in the literature. Murray and Olcese (2011) found that most iPad apps used in education were based on either content transmission or behaviourist drill-and-practice approaches, concluding that “the bulk of the applications written to run on iOS devices are woefully out of sync with modern theories of learning and skills students will need to compete in the 21st century job market” (Murray and Olcese, 2011). While they were referring to the iPad 1, this study serves as a cautionary point that these devices are not immune from concerns about pedagogically regressive uses of mobile devices. Furthermore, Cochrane et al. (2011) who also examined the iPad 1, found support for the “pedagogical integration of the iPad within social constructivist learning environments” in a series of four case studies. Clearly there are uncertainties between the potential and actual uses of tablets in education, which is further complicated by the release of the iPad 2, 3 and 4; about which few empirical studies have been published.

The use of tablet PCs in mathematics education offers a viable means to address these concerns and enhance student learning. Tablet PCs permit students to use a stylus to “ink” or write on the screen and free students from relying on keyboarding as the primary means of data entry; of particular interest for inputting complex equations. Similarly, the instructor can electronically distribute the PowerPoint slides for a particular class session and students can use tablets to take notes directly on the slides in real-time during class. Since students have access to the instructor’s lecture slides electronically, they do not need to focus on simply recording information from class and they are able to concentrate on processing the information that is presented. The tablet environment facilitates a change in the fundamental activities of students from passive recorders to active participants. Tablets also promote interactive problem-solving and peer critiquing during lectures (Brown-Martin, 2010). Tablet based mathematics instruction also provides a powerful means to change student behaviour during classroom learning. When students participate in a class in which their work may be presented (either anonymously or self-identified), the induced pressure presenting their work to the class can motivate students who might otherwise not invest themselves in the classroom experience (Cochrane and Rhodes, 2011).

Further, tablets in a classroom setting to present student-generated solutions is also a powerful tool to influence the normative behaviour of some students. When students see the work of their peers and realize that their own solutions or understanding are deficient, they discover this much sooner than if they had to wait for the results of an examination to be posted. This formative assessment can enable students to address their weaknesses before they become obstacles to learning more advanced material. A tablet’s ability to accept handwritten inputs, whether from using a fingertip or a conductive stylus/pen is a unique advantage of the tablet over a traditional computer, and allows students to record all of their lecture notes digitally, rather than relying

on a mixture of electronic and paper notes (Foster, 2005). Another study conducted at Vanderbilt University surveyed students who owned and actively used tablets as part of their learning “toolkit” (Rickman, Miller, Verbick and Todd, 2006). The students overwhelmingly agreed that they benefited more from watching “the instructor develop equations and solutions to problems in real-time on the tablet, rather than from a PowerPoint presentations alone,” and 44% agreed that they paid “more attention in class when the tablet device was used.” This finding suggests new technologies incorporated in the classroom and teaching practice will inevitably lead to greater interest amongst the students as a consequence of personal inquiry.

Throughout the literature examined, a consistent theme of ease of use was stated from the students’ perspective across different disciplines. Using a tablet to read e-books and perform digital annotation of lecture files represented an efficiency improvement over traditional textbooks (Garnett, 2010). An additional benefit of using tablets for taking notes was found in the ability to handwrite information on the screen, overlaid against existing content such as diagrams (Mendelsohn, 2003). Among other advantages identified are the tablet’s portability, consolidation (having everything in one place), long battery life, versatility (VoIP, instant messaging, e-mail), and connectedness. In one study conducted by Timmermann (2009), a student pointed out that there are often situations where a laptop feels intrusive, while the iPad feels professional and discreet. Studying with the iPad, the student discovered that they felt less distracted, and retained information more readily, attributing this to the application-based format of the iPad, which discouraged them from multitasking (Timmerman, 2009). The tablet’s portability and quick startup allowed for reading anytime, anywhere, helping the student to keep up with class readings.

The literature has conflicting themes that tablets in general support learning and educational goals; or conversely considered as “time wastage” and an “entertainment tool with almost no role in learning” (Churchill, Fox, and King, 2012). Kontos (2001) found that teachers’ attitudes towards the use of new technology for educational purposes inspire and influence the students towards technology use in general. Mang and Wardley (2012) detailed the main advantages of using tablet technology: using software applications to enhance creativity and critical thinking, using digital texts and readings which lead to substantial cost savings for students, and encouraging greater interaction among students and faculty. Based on the examined literature, the following six recommendations are for faculty who are considering adopting tablets as a mandatory component in their classrooms: (1) Know “everything” about the tablet operating system prior to distributing tablets to students; (2) Decide early on how you would like to use the tablet in your class; (3) Ensure that you work closely with your institution’s Information Technology department; (4) Make the tablet an integral component of your class; (5) Describe the features and benefits on the first day of class; (6) Carefully consider how to distribute the tablets to students. Students will look to their instructor as the “expert” and they must be prepared to answer any questions students may have, so that they can be confident that the adoption of a tablet is a worthwhile endeavor (Rossing, Miller, Cecil and Stamper, 2012).

### **Study Methodology**

The study has been designed for analysis of the first year population of students in the Bachelor of Commerce Honours (BComm) program of the Faculty of Business & IT at UOIT. Our study is in the second phase, and the results discussed in this paper represent a second cohort of students and instructors we have surveyed and interviewed. Our current population of first year Commerce students were invited to participate in the study in August 2014, prior to commencing their first year semester in September 2014. Based on applications, 50 students were selected at random to participate in the pilot tablet program. Each student in the pilot was provided with a Microsoft Surface Pro 3 tablet at the end of September 2014. The instructors who would be teaching these students, including 25 teaching assistants (TA's) in the Winter 2015 semester were also provided with a Microsoft Surface Pro 1. Courses taught in the winter semester included business math, business computer applications, financial accounting, macroeconomics, and business communications. Students and instructors became familiar with the tablet during the fall semester as they acclimated to the Surface tablet and its features, including Windows 8.1. In the Winter 2015 semester, the instructors were asked to adapt their teaching pedagogy, where possible, to engage students with the Surface Pro tablets. They were encouraged to try new approaches and to enable their students to use the tablets in their lectures, assignments, and other class activities. Students in the pilot would all follow the the same commerce course schedule in the winter semester to ensure that there would be a high concentration of students with the devices in each course.

A survey was designed to understand the perceptions of the use of tablets by students. This survey included a blend of Likert scale results as well as open ended qualitative questions. For this first phase of the study, the target participant pool was the first year BComm students (a population of 321 students enrolled in the Business Communications course). The survey was open 2 weeks of the Fall 2014 semester beginning November 14, 2014. A total of 64 responses were collected with 43 completed surveys. Of these participants, 19 students were from the tablet study population (44% of the tablet study population). Statistical analysis of the results of the population as a whole and by cohort were examined. The qualitative data was coded using a two coder system and validation approach to minimize potential bias and improve the reliability of the codification of the data. The qualitative data was analyzed to determine its correlation with the quantitative responses.

In January 2015 we conducted five interviews with instructors who had been using the Surface Pro 1 tablet for grading and instruction in their classes. The data gathered allowed for a more indepth exploration of perceived barrier and benefits of the tablet devices now that they had experienced courses trying to make use of the tablet's capabilities. This insight also provided additional information on the infrastructure and training required for faculty members to integrate such learning tools into their curriculum. In the final phase of our study, we are planning to hold focus groups in April 2015 for both students and instructors. In our previous study, it was found that focus groups were a



valuable discussion which shed light on the differences between student and instructor perceptions of the technology.

## **Study Results**

### **Student perspectives**

The focus of the survey was to understand what students knew about tablets, how they were currently using them (both for their personal life and for education), and finally how they believed they could be used in the future to enhance their learning environment. The distribution of survey participants was 68% male and 32% female which is similar to the Bachelor of Commerce population at the institution. It was interesting to note that 68% of respondents stated they owned at least one tablet device (some students had multiple devices). The majority owned an iPad (37%) which we believe contributes to some of the specific comments around usability which we will discuss later in the results section. Given that most students have access to a tablet device, we were interested in understanding how they were currently using the tablet in their daily life and coursework. Not surprisingly, when asked how they might use a tablet device outside of coursework, the general consensus was around entertainment uses. In particular social media 'apps', games, email communications, and general web browsing, were the primary focus of tablet usage. As one of the student tablet study participants concisely stated: "I used it for note-taking, accessing my e-books, completing assignments, checking blackboard, messaging my profs, managing my email." In general, the activities where students spent the most time engaging with their tablet device was for general web browsing (average 5.9 hours), social media (average 5.1 hours), listening to music (average 5.6 hours), and watching videos (average 5.3 hours). Completing coursework (notes in particular) and access the learning management system (Blackboard) were also listed as high usage activities at an average of 5.17 hours and 4.4 hours respectively.

When students were asked to express how they might use a tablet device in their coursework in the winter semester, they provided a wide range of examples. In particular, students expressed a strong interest in using the tablets for note taking, particularly for math and diagrams. As one student stated, "Writing equations, making diagrams or graphs in calculus with the stylus pen that is provided with the tablet. This was a great advantage as we were able to colour-coordinate with the different colour ink and would keep up with the professor in class effectively." Another student added: "Using OneNote for note taking, it is easier than getting paper and writing it out." Students also commented on their interest in using the tablet device for reading e-books. Many students expressed that having all their books easily accessible on the tablet device would be convenient for studying, searching for materials during class, and would be much more convenient than carrying a large set of textbooks. In particular, one student stated, "The tablet enables me to read course books in digital format anywhere, without the bulky laptop." This was echoed by another student who stated that the smaller size enabled improved usage for studying during his daily commute on the bus. A final focus point for many students was the ability to check the learning management system (Blackboard) on a regular basis to keep up with class announcements, discussion boards, and course activities. One student stated

that the tablet was faster than the laptop for accessing Blackboard and that the tablet was a convenient size for reviewing slides and notes placed on Blackboard by the instructor. When asked explicitly to explain the potential advantages of tablet devices for coursework, students generally focused on the ability to facilitate note taking, the light weight and mobility of the device. In particular, one student stated: “The tablet excels in note-taking territory as I find myself being able to record much faster, especially those that fall outside of words that can be typed. The other main advantage is the tablet’s light-weight makes it much easier to carry around campus.” The advantage of portability was mentioned by 68% of the respondents in their answers to this open ended question. To this, another student commented on the long battery life, which removed the need to carry a charger and find an available outlet when using the tablet.

The students also identified a number of potential disadvantages to using a tablet in their coursework. The top five included; distractions (45%), keyboard deficiency (14%), small screen size (12%), software incompatibility (11%), and none (9%). In particular, the most common disadvantage of tablets, being distractions, is similar to concerns regarding laptops in the classroom. The small screen size was also a common concern, particularly when trying to work in Excel. In particular, students in the study stated that the icons were too small which made navigation difficult (this is a setting in the operating system which defaults to a larger size in the newer version of the device). There are also a couple of disadvantages included in the top five which may be a result of the type of devices the participants currently own. The concern around the lack of a keyboard may be due to the fact that many participants had their own devices which did not come with a keyboard. Many students stated simply: “No physical keyboard.” Those in the study Surface Pro 3 population who were provided a keyboard with the tablet device did not identify the keyboard as a major disadvantage. Similarly, program incompatibility may also be a result of the majority of respondents having an iPad or Android tablet device which do not support the use of general business (primarily Microsoft Windows) software such as Microsoft Office suite. Once again, those in the pilot did not express software compatibility as an area of concern.

Students did express interest in having a better method of transferring files/data from the tablet device to a computer or laptop for working on longer essays or assignments. This is supported through many cloud data storage solutions but many students did not know how to use these tools. There were also a number of other applications that students expressed an interest in obtaining such as a Blackboard application, a notepad application, and an application to create a binder of course work, calendar applications, and e-book application capable of importing material from all publishers. The majority of these applications already exist (e.g. OneNote for note taking and binders). These responses demonstrate that there is a significant amount of training and support required to help students understand how to leverage tablets as education tools.

### **Instructor perspectives**

In order to fully investigate the usage of tablets we conducted interviews with faculty members who were also provided with a tablet as part of the study. The general feedback on the tablet devices reflects that from the students. The faculty members found the Surface Pro tablets to be lightweight and easier to take with them to classes and meetings. They also appreciated the ability to draw, annotate, and write directly on PowerPoint slides and other documents using the tablet. These key features enabled faculty members to be more efficient in their grading and to provide a richer experience in the classroom. They also expressed concerns about the ability to easily type using the tablet. Most instructors found the provided keyboard to be too small for typing essays and generating course notes. That being said, many faculty members also experienced difficulty in learning how to use the tablet effectively in their teaching. There was also a difference in the steps to connect the tablet device to the classroom infrastructure. Given the limited number of USB ports on the tablets, it was necessary to acquire small USB hubs to allow instructors the ability to connect both a USB key for data transfers as well as other peripherals. Some faculty members were faced with infrastructure barriers when using the tablet in the classroom. Instructors wished to be able to use the tablet to engage with students throughout the room, but due to the necessity to be physically connected to the projector system, they were unable to carry their tablet to the students. As one instructor stated “It would be great if there was a wireless display. Students would be able to share their work and ask questions from their seats using their tablets.” Another added “Being able to move around with a tablet is much more engaging when teaching...you could move around and ask students for participation.” This was of particular interest for sharing the process of problem solving required in mathematics and programming. Instructors have indicated that they will not change their teaching practices, in-class activities nor student assignments unless the tablet is fully supported by the teaching and learning centre at the institution. As one instructor stated:

*“I have been teaching the statistics course for several years, my tutorial content is well prepared and the in-class activities have been designed to supplement the textbook theories the professor teaches. The assignments require the students to use SPSS [a statistical analytics tool] which does not require much processing power, but is certainly much easier to use with a large screen. Also, due to the large numbers of students in the course, the assignments require rubric or template marking with feedback. These took a great deal of time to develop and fine-tune, which again could not be replaced by digital annotation. From my own course experience, there is no particular benefit to using the tablet compared to the laptops we already use and the online course management site (Blackboard) we use for assignment submission and grading.”*

Instructors also found that there was limited support in the Teaching and Learning Center (TLC) on the use of tablets in education. Instructors were interested in trying new software or techniques such as Graphcalc, OneNote, Sketchbook, and various Responseware tools to engage with students. In particular, they encountered difficulty in getting a response as to whether

existing software used on the laptops would be capable of interacting with the tablet pen. All instructors were in agreement that having professors knowledgeable in using the tablets was important for helping the students increase their learning capabilities with the devices. They found that students were fascinated with the new technology but that many did not understand the potential of the devices for increasing their productivity. Instructors agreed that training sessions were critical for students to learn the benefits of tablets and the software necessary for them to be used effectively as a learning tool. Recommended software included OneNote and cloud storage solutions such as Google Drive for data sharing and movement between devices.

### **Conclusions**

If the purpose of integrating technology into the classroom is to increase student engagement and prepare them for the 21<sup>st</sup> century workplace, then initiatives such as tablets for teaching and learning need to continue to be explored in the higher education context. Both students and faculty agree that tablets have the potential to improve note-taking and student interaction in the classroom. To effectively integrate tablets into the learning process, both students and faculty need additional training and support on the potential advantages of these devices. Users are willing to try new techniques and spend the time to learn new skills while trying to master the tablet devices. This may not be the same for all students or faculty members at an institution. More and more organizations are moving to mobile devices such as tablets for their daily work; if our graduates do not know how to use these devices to support their daily work activities, they will be at a disadvantage in the current workforce. To support a move from laptops towards tablet devices, the institution needs to ensure that there is adequate support in the Teaching and Learning Centre on the use of tablets for student and faculty engagement.

This includes the technical skills to work with faculty members to test innovative applications of the tablet PC, as well as knowledge on the limitations of existing software to interact with the tablet inputs such as digital inking and annotation. Demonstration tablets configured with the latest software images should also be available for faculty members to borrow as they experiment with the new technology. Having the ability to try the tablet before moving to a new technology will reduce their reluctance to change. Information should also be available to both faculty and students on how to set up a home office to easily connect the tablet device to a full sized keyboard and monitor display. For those who are technologically savvy, workshops may be unnecessary, but for many this will help ensure they can leverage all the benefits of a tablet when they are on the go, while having few drawbacks when they are interested in typing longer essays or working on complex projects. The classroom infrastructure needs to be updated to ensure that mobility is supported. The most important aspect of this is wireless connectivity to the projectors so that instructors can move among the students with the tablet for increased engagement and sharing of ideas. If this is not immediately possible, then the existing podium setup needs to be organized to ensure the tablets can be easily connected in a way that they are still accessible for annotations during the class sessions.

Given the extensive need of students to engage in word processing, data analysis, and presentation tools, tablet devices seem at this time not ideally suited to exclusively meet all computing needs of students and instructors. Rather, they serve as an additional device to augment and expand the connectivity and computing choices for those who desire increased connectivity and social interaction, with improved applications and interface choices not currently offered by smartphones or laptops. In addition, collaboration and social interaction between students can be enriched, as more technically literate students can assist novice students with their tablet devices. Nevertheless, tablets leverage the technology skills of incoming students and alleviate some of the frustration current students experience with laptop devices. Tablets are a useful addition to the digital toolkit for students and instructors, but exhibit too many drawbacks in the area of content creation and cross-platform compatibility to be made a required tool for all users. This study represents an initial starting point to understanding the impact of tablet devices in higher education learning environments. Furthermore, students and faculty were provided with limited training on the many features and uses of the Surface Pro tablet device and Windows 8.1 environment. Given the small cohort of students involved, and the short timeline for preparation of course material, instructors felt they were unable to fully integrate the tablet devices into their curriculum. It is recommended that the study be repeated after the development of training for students and faculty, and updates for mobility in the classroom are made to the infrastructure. Future research is required to consider the long term implications for student retention rates, academic performance, and job market demand for these technology skills.

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