



TABLET TECHNOLOGIES AND EDUCATION

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ABSTRACT

Recently, tablet technologies have grown tremendously in popularity. They lend themselves to a myriad of learning modalities and therefore may be well suited to use in schools and universities. While teachers work to find useful applications for tablets, students have already begun using them at home and, in secondary and higher education, in classes. Unfortunately, sometimes when students use tablets for courses they play with “apps,” rather than using the technology as a useful and powerful tool. The current article addresses ways to use tablet technologies to their fullest potential as important learning devices in higher education.

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1. INTRODUCTION

In the last decade, education has taken on a new rhythm in the lives of students and society. No longer is learning done at specific hours of the day in specific locations (generally schools and universities). Now education is something that occurs whenever a learner has a question or wonders about something and possesses a device to help him or her answer the query. Mobile learning is one of the forms in which current education occurs. Learning is not just facilitated through mobile technologies, but also exemplified by the variable locations of the scholar and the information itself (Sharples *et al.*, 2010). Mobile learning devices include phones, laptop computers, and tablet technologies, such as the iPad and Android. Recent innovations in tablet technology have included computing devices that respond to touch, rather than, or in addition to, operating by mouse, stylus, track pad, etc. This form of operating is called gestural and the interfaces operate using Gestural Interface Technology (GIT). Gestural interfaces (Norman and Nielsen, 2010) include interactive whiteboards, smartphones, and most recently, tablet technologies. Only available since approximately 2010, gestural tablets have rapidly become popular with the public, with both adults and adolescents alike. These tablets have slowly made their way into schools and universities, with the institutions working once again to catch up with the technological innovation and find an educational use for it. Given the recency of tablets being

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used in the classroom, there is limited information as to the benefit of such practices on the teaching and learning process. There are however some features of tablets that appear to benefit students in a variety of ways. Due to their multitude of usability options, tablet technologies lend themselves to a myriad of learning modalities – visual, tactile, and auditory. The various makes, models, sizes and price ranges make the technology widely affordable and accessible for user needs. Unlike desktop computers or laptops, they adapt well to the needs of many different types of learners. The visual learner benefits from the wide range of applications on a tablet that has graphical user interfaces (GUIs) which represent ways of navigating a software, creating multimedia projects, and demonstrating understanding of concepts. Auditory learners find the sound options advantageous because text can be read, visual representations described, and of course, music and video are also included as features. Additionally, the most unique aspect of a tablet is the way the user operates it. Tablets are not operated via mouse or track pad, but rather contact is made right on the screen itself, by the fingertips of the user. This feature is helpful for tactile learners who might have trouble remembering visual or auditory facts, processes, and instructions. By using their hands to proceed through websites, software and applications containing needed information, tactile learners possess a greater chance of being able to process and retain whatever it is that they need to learn. Generally, tablets are convenient devices that can handle many of the tasks of a small computer. Tablets and other portable devices have been marketed to everyone from young children to working professionals, and from the stay-at-home parent/guardian to the world traveler. Accordingly, it's no surprise to see secondary school and college students bring tablets into their classes to use for coursework. Although having students use tablets in class to facilitate their learning sounds like a good idea, unfortunately learners often simply play with "apps" (applications that behave like software) rather than using the technology as a useful and powerful production tool in the teaching and learning process. Although a reasonably new topic in the literature, an assortment studies have been conducted in order to investigate the potential of tablet technologies in education.

2. LITERATURE REVIEW

In a longitudinal study conducted in Belgium, [Courtois et al. \(2013\)](#) found that secondary students used tablets in school because they perceived them as useful and enjoyable, rather than because their peers convinced them it was the newest technology to own. [Sullivan \(2013\)](#) reported that iPads supported both a student-directed approach to writing and an inclusive classroom. With early learners (preschool and early elementary students), [Couse and Chen \(2010\)](#) ascertained that children navigate and explore tablets with ease, feeling comfortable and learning by playing. [Richardson \(2012\)](#) contends that tablet technologies have increased the benefits of educational games in both the classroom and the home by making the games more accessible to P-12 students. Interestingly, [Jones et al. \(2012\)](#) determined that children's emotional responses to archived photographs were stronger when they viewed the pictures as physical items, while their cognitive responses were stronger when the photos were viewed digitally on tablets and/or flat screen televisions. In an associated study, students reported that viewing

video lectures on tablets was a useful resource [Vondracek \(2011\)](#). [Kim et al. \(2013\)](#) recorded and analyzed secondary student's written work during math tests using tablet and stylus technologies to expedite the evaluation process. In perhaps the most powerful study, [Ferrer et al. \(2011\)](#) found that use of low-performing student test scores increased when using tablets in a public school in Spain.

In addition to researching the use of tablet technologies in P-12 schools, several investigations were also conducted at the post-secondary level. Using an "active engagement metric," [Fagen and Kamin \(2013\)](#) found student engagement in programming computer code to increase when using tablet technologies during college class discussions. Similarly, [Nortcliffe and Middleton \(2013\)](#) surveyed university students in the United Kingdom and their results support the idea that tablets foster autonomous, pervasive, student engagement. In their 2011 study, Loch, Galligan, Hobohm and McDonald utilized netbook tablets with volunteer students in college math courses. Their results cautioned that although the tablets promoted learner-centered pedagogy, the reduced cost of netbook tablets may not be worth the limited computing power that they provide. Conversely, in their 2012 research, Galligan, Hobohm and Loch concluded that students using tablets in a distance math course found that the technology facilitated assignment submission, efficient instructor feedback, and communication about math concepts between students and the instructor. [Romney \(2011\)](#) conducted a longitudinal study which revealed that undergraduate students who began their mathematics education using tablet technologies were more likely to continue their studies than were their non-tablet using peers. In 2012, Lavery found that college students using tablets for online creative writing and English classes participated more in online activities. In an important study, [Milner-Bolotin and Antimirova \(2010\)](#) discuss the need for instructor training, mindfulness, and rehearsal with tablet technologies before using them in higher education physics classes. Finally, [Manuguerra and Petocz \(2011\)](#) advocate tablets as a way to change the teaching and learning process in higher education, specifically the way that students engage with each other and the content. The [NMC Horizon report \(2012\)](#) identifies tablet technologies as entering the mainstream of education at the present time. Given the prevalence of tablets in homes and in the workplace, and the rapidly growing appearance of this technology in classrooms, it's clear that the predictions in the report have come to fruition. However, despite the presence of tablet technologies within education, their utility in the teaching and learning process remains a challenge. It is therefore worth discussing some applications useful for the classroom so that this innovation can become a more powerful tool for both instructors and students.

3. DISCUSSION

Any current, useful, technology has a suite of productivity applications that include word processing, a database, a spreadsheet, and presentation software. Office Suite is one of these collections of applications and there is a free version as well as professional versions available for the Android tablet. Pages is the set of programs for the iPad that is similar to Office Suite. These applications can allow the user to type word documents, create spreadsheets, and design

presentations. Files in Pages are compatible with the Office Suite on a computer, laptop, and /or netbook. Given that productivity applications are the most commonly used programs on a computer, it would stand to reason that they would also be the most useful items on a tablet as well and make the technology more useful for both teacher and student productivity.

Other types of tools available on tablets lend themselves to the organization of the learning process and students could benefit from gaining facility with them. Business Calendar helps keep track of schedules and appointments, while a program like Doodle allows members of a group to coordinate schedules for meetings and conferences. Financial/Budget application keeps track of spending practices and Time Tracker or Timesheet calculates the amount of time spent on a task or project. Also, programs like Ever note allow users to take notes while mind mapping applications such as Mind Meister help coordinate and systematize brainstorming sessions. Tools such as these not only make productivity more efficient, but they also aid in project creation by helping students, and instructors, manage their time, assign tasks, and organize ideas, concepts, and processes.

Additionally, multimedia applications are available for tablets for students who enjoy creative studies and hobbies. Musicians, audio engineers, or music aficionados would enjoy and use programs such as Pandora, Spotify, Jet Audio, Wireless Mixer, Caustic, Equalizer and Music Volume. These “apps” allow users to produce, record, edit, mix, and clean up audio files. Multimedia and its associated soft wares are particularly important because they give students another means of demonstrating “knowing” if they are not good at, or in addition to, the traditional reading, writing, and presenting to demonstrate understanding of a concept. Multimedia tools also give teachers the ability to offer alternative assignments and assessments so that students with a variety of who possess a variety of Multiple Intelligences (Gardner, 2008) are better able to engage in the learning process.

While it is important to give students many avenues to understanding concepts and to demonstrate what they know, often these highly creative products produce huge files that necessitate a significant amount of storage space. Neither students not teachers consider virtual storage components for the technology products that they are assigning or designing. They would more likely think of storing their files on an external hard drive, or a flash drive (a risky move since flash drives truly are not meant for storage, but rather for transferring files from one place/user to another). A better alternative than either external hard drives or flash drives is the concept of cloud technologies. Cloud technologies are virtual spaces hosted by a third party on a web service interface, outside of a individual’s personal computer, where information can uploaded and stored and/or transferred and programs, documents, resources etc. can be accessed and used (O’Brien and Marakas, 2011). Cloud technologies are becoming intimately linked to table technologies since many current tablets are being produced without the ability to connect any kind of external drive for transferring and/or saving files. Although cloud technologies are becoming increasingly common, students and instructors do not seem to avail themselves of this option as often as they could or should. It would serve both students and educators well to avail themselves of cloud storage technologies more. One of the most popular types of cloud storage is

Dropbox.com. It is a virtual storage space and offers 2GB of online storage. All a user needs to do is sign up in order to open a free account. For additional storage capacity, in the 5GB range, there are other options, such as Google Drive, Ubuntu One, Open Drive, and/or Cloud Drive. While SkyDrive from Microsoft offers 7GB, for users who need even more storage, there is 4Shared.com – which provides 15GB of online storage. If a user has multiple online storage accounts and does not want to log into every account to see where things are located, then an interface, such as Zero PC [www.zeropc.com], can allow him/her to login to all his/her accounts at once. This option also gains the user approximately 40-45GB of online storage, adding to the overall storage capacity of a tablet. These are all very helpful options since they are free and would allow students to share files between devices & computers, thus increasing their ability to work more easily with others in groups or teams, regardless of whether they meet face-to-face or not. (For virtual meetings, programs such as Skype, ooVoo and Face time work wonderfully via tablet technologies.) Technical usability issues are key when teachers and students enter the digital realm since learning and creating projects can be frustrating by themselves. Adding a layer of technical frustration on top of the normal challenges that occur in the learning process can often shut down a student (or educator) completely and turn them off to either the concepts being learned or the medium through which they are learning, or both. Using easily accessible common digital spaces through which students can share work is important when integrating technology into education.

Perhaps the most cutting edged of all the tablet applications is the ability to communicate between types of hardware. Some apps, such as Dolceri, offer communication between iPad tablets and laptops via Bluetooth. With the laptop connected to a projector, a user could then have a somewhat interactive screen with a tablet serving as the “remote”. A teacher could simply walk around the classroom and give a presentation or mock lesson with the added ability to work on the iPad and have the results displayed on the screen at the front of the room. Options for more interactive types of learning could easily occur using tablet technologies as students share whatever is on their tablet with the rest of the room via a projection application. This type of feature is particularly powerful with peer-editing or group review and analysis of student-produced work. Allowing everyone in the class to see the same piece of work and interactively discuss and work on it is an extremely engaging and useful pedagogical technique.

Regardless of what the latest technological device may be, the key for enhancing the teaching and learning process is to use the device and its associated programs to their fullest extent. Given the newness of gestural tablet technologies, the potential of these tools are in the process of being discovered. There remain many facets of using tablet technologies in education yet to explore.

4. FUTURE DIRECTIONS

Tablet technologies may well usher in a new way of teaching and learning. Less expensive than desktops and laptops, tablets are also more portable and provide easier access to applications such as email and Internet searching. Conversely, they are less user-friendly when working on

large projects, papers, or multimedia products. Smartphones are also not useful for completing large-scale work, but they are more portable than tablets. However tablets are infinitely less expensive because they do not require a monthly fee to remain in use. Given their limitations, and clear advantages, tablet technologies may well be an innovation that becomes pervasive in schools and schooling.

In his writing about technological innovations and education, [Thiruvathukal \(2013\)](#) states that, "If we don't change, others will change us and render us obsolete or, worse, irrelevant." It will do harm to students, teachers, and the educational process in general if pedagogy does not keep pace with technology. This challenge is even more urgent than in previous eras due to the nature and preferences of the students who are currently in schools. [Gardner and Davis \(2013\)](#) have labeled the current cohort of youth the "App Generation." They claim that these individuals are immersed in all facets of digital media, which affect their sense of identity, intimacy, and imagination. These attributions are quite compelling and educators today must be cognizant of who they are teaching.

While challenging, this set of circumstances is alive with potential. [Jones and Thiruvathukal \(2012\)](#) call these situations "possibility spaces." They consider possibility spaces to be everywhere, in everything, with new ideas, innovations, and techniques just waiting to be discovered. Given this framework, several aspects of using tablets in the classroom have yet to be investigated. These areas include use of tablets on a large-scale basis in a school or school district, longitudinal studies of using tablets in the classroom, the effectiveness of using tablets in teacher preparation program field placements, and most importantly, measuring the learning gains (if any) from utilizing tablet technologies in the teaching and learning process. Studies such as these should and will likely be undertaken in the next several years and our knowledge of and facility with using tablets in the classroom will likely both broaden and deepen. Only time will tell if tablet technologies in the classroom are here to stay.

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