Exploring Factors that Influence Technology-Based Distractions in BYOD Classrooms

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**Abstract:** Previous research on distractions and the use of mobile devices (PDAs, tablet PCs or laptops) have been conducted almost exclusively in higher education. The purpose of the current study was to examine the frequency and influence of distracting behaviours in secondary school, Bring Your Own Device (BYOD) classrooms. Quantitative and qualitative data were collected from 181 secondary school students (55 females, 126 males) enrolled in three schools across Canada. Almost 80% of the student reported being on tasks regularly when using mobile devices in class. However, students also engaged in a number of distracting activities including emailing (64%), surfing the web (65%), using social media (52%), instant messaging (32%) and playing games (30%). Female students engaged with social media significantly more than males, whereas males played games significantly more than females. Students were rarely distracted by peer use of mobile technology devices. Students were more distracted with mobile devices when engaged in independent or group work, and less distracted with lectures and student presentations. Students claimed that teacher and school restrictions were probably the most effective method to limit distracting behaviour learning.
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Abstract

Previous research on distractions and the use of mobile devices (PDAs, tablet PCs or laptops) have been conducted almost exclusively in higher education. The purpose of the current study was to examine the frequency and influences of distracting behaviours in Bring Your Own Device (BYOD) classrooms in secondary school. Quantitative and qualitative data were collected from 181 secondary school students (55 females, 126 males) enrolled in three schools across Canada. Almost 80% of the student reported being on tasks regularly when using mobile devices in class. However, students also engaged in at least one of five distracting activities “occasionally or regularly” with their mobile devices including emailing (64%), surfing the web (65%), using social media (52%), instant messaging (32%) and playing games (30%). Female students engaged with social media significantly more than males, whereas males played games significantly more than females. Students were rarely distracted by peer use of mobile technology devices. Students were more distracted by their own use of mobile devices when engaged in independent or group work, and less distracted with lectures and student presentations. Students claimed that teacher and school restrictions were probably the most effective method to limit distracting behaviour learning.

Keywords: laptop; tablet; mobile device; distraction; secondary school; gender; pedagogy
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Overview

A mobile device allows a student to engage in educational activities any place, anytime (Kukulska-Hulme, 2005; Naismith, Lonsdale, Vavoula, & Sharples, 2004). The most commonly mobile technologies used by students are smartphones, tablets, notebooks, laptops, and hybrid devices (Chen, Seilhamer, Bennett, & Bauer, 2015; Harris Poll, 2015; Wu et al., 2012). Ubiquitous access to mobile computer devices is becoming more prevalent in primary, secondary and tertiary school systems and represents a potentially valuable educational opportunity (Hwang, Tsai, & Yang, 2008; Kay, 2008). Extensive research on student use of mobile devices in the classroom has been conducted in higher education (e.g., Fang, 2009; Gaudreau, Miranda, & Gareau, 2014; Junco, 2012a, 2012b). Primary advantages of using mobile devices are increased student performance, better communication among students and teachers, and improved learning experiences (e.g., Aguilar-Roca, Williams, & O’Dowd, 2014; Awwad & Ayesh, 2013; Barak, Lipson, & Lerman, 2006; Kay & Lauricella, 2011a; Ragan, Jennings, Massey, & Doolittle, 2014). Key challenges of using mobile devices in class are limiting distractions and developing effective implementation and management strategies (e.g., Bowman, Levine, Waite, & Gendron, 2009; Junco, 2012a, 2012b; Rosen, Carrier, & Cheeva, 2013). Some authors have argued that the cognitive cost associated with engaging in distracting behaviours can have a significant impact on academic performance (Burak, 2012; Fried, 2008; Junco, 2012a, 2012b; Kraushaar & Novak, 2010; Ravizza, Hambrick, & Fenn, 2014). To date, the majority of research on mobile device use has concentrated on higher education, perhaps because of the prevalence of these devices in college and universities (Dahlstrom, Walker, & Morgan, 2008).
Exploring Factors that Influence the Use of Mobile Devices in the Classroom

2013). However, access to mobile devices in secondary schools has grown significantly, as more schools are moving toward BYOD programs (Hwang et al., 2008).

A number of gaps exist in the research on investigating the use of mobile devices in the classroom. First, although comprehensive research on the advantages and challenges of using these devices in the classroom has been examined in higher education (e.g., Fried, 2008; Gaudreau et al., 2014; Kay & Lauricella, 2011a; 2014; Kraushaar & Novak, 2010; Lindroth & Bergquist, 2010), secondary school students’ perspectives have not been explored. Second, limited research has concentrated on specific activities that secondary school students engage while using mobile devices in class. Third, while specific tasks that higher education students pursue with their devices has been researched (e.g., Gaudreau et al., 2014; Judd & Kennedy, 2011; Junco, 2012a, 2012b; Ragan et al., 2014), the factors that lead to distracting behaviour have not been examined.

The purpose of the current study was twofold. First, we explored the prevalence of specific distracting behaviours that secondary school students engage in while participating in a BYOD program. Second, we examined factors that might influence distracting behaviours including gender, peer distraction, and instructional method.

Literature Review

We conducted a comprehensive review of the literature on the use of mobile devices with a focus on distracting behaviours. For the purpose of this paper, distractions are operationally defined as activities are not directly related to achieving designated learning outcomes in a class (Gerow, Galluch, & Thatcher, 2010; Taneja, Fiore, & Fischer, 2015). The majority of the studies on distracting behaviour focus on laptop devices as opposed to tablets or mobile phones. We will discuss two main themes in detail: distracting behaviour
(communication, search the web and entertainment) and factors that influence distracting behaviour (gender, peer behaviour, instructional method).

**Distracting Behaviours**

Researchers have reported that higher education students engage in a variety of distracting behaviours on their laptops during class. In at least three studies, 50 to 65% of students engaged in distracting laptop-based activities during class (Jacobsen & Forste, 2011; Ragan et al., 2014). The literature review revealed three main categories of distraction: communication, searching for information, and entertainment (Aguilar-Roca et al., 2012; Awwad, Ayesh, & Awwad, 2013; Barak et al., 2006; Fried, 2008; Kay & Lauricella, 2014; Ragan et al., 2014; Turkle, 2008).

A number of researchers found that students engaged in distracting communication-based activities such as following social media feeds and emailing while in class (Aguilar-Roca et al., 2012; Awwad et al., 2013; Barak et al., 2006; Fried, 2008; Kay & Lauricella, 2014). Awwad et al. (2013) surveyed female engineering, science, and IT university students’ laptop activities during class and observed that a majority were frequently using their devices for social media and email. Other studies have also reported university students used social media (e.g., Aguilar-Roca et al., 2012; Barak et al., 2006; Kay & Lauricella, 2014) or sent instant messages (e.g., Fried, 2008) during class. Turkle (2008) argued that the idea of sending out an email or testing during class is so commonplace, that students no longer feel the need to conceal this distracting behaviour.

Researchers have also observed higher education students searching for various personal information during class (e.g., Fried, 2008; Kay & Lauricella, 2014; Ragan et al., 2014). Fried (2008) and Kay and Lauricella (2014) both reported that students would surf
the web during class time. Ragan et al. (2014) added that undergraduate students surfing
the web for personal reasons accounted for almost 40% of all distracting activities.

Several researchers reported that higher education students use their mobile
devices for entertainment purposes during class, such as playing games or watching videos
(Awwad et al., 2013; Barak et al., 2006; Fried, 2008; Kay & Lauricella, 2014; Tallvid, Lundin,
& Lindström, 2015). Kay and Lauricella (2014) revealed that higher education students
would play games on their laptop during class, albeit infrequently. Awwad et al. (2013),
Barak et al. (2006) and Fried (2008) noted similar results of higher education students
playing games on their laptops while in class. Tallvid et al. (2015) indicated that 30-50%
of junior high school students (grades 7-9) reported playing games on occasion or daily
with their mobile devices during class.

Factors that Influence Distracting Behaviours

A limited number of studies have looked at factors that might lead students away
from on-task learning activities to distracting behaviour with their mobile devices (e.g.,
Carrier et al., 2009; Judd & Kennedy, 2010; Junco, 2012b; Spink, 2013). Four possible
influences have been noted including gender, peer behaviours, the instructional method
used, and restrictions implemented.

Gender. A number of researchers have explored male and female attitudes,
behaviours, and use regarding technology (Barker & Aspray, 2006; Kay, 2008; Kay and
Lauricella, 2011b; Rideout, Foehr, & Roberts, 2010; Sanders, 2006). Kay (2008), in an
extensive review of the literature on gender and technology use, reported that there were
small or no differences between males and females with respect to attitude, behaviours,
and use of technology in elementary, secondary and tertiary school environments.
For mobile device use, one of the main differences between males and females regarding distracting activities is the type of activity chosen. For example, males appear more likely to play video games on their laptop devices than females (Barker & Aspray, 2006; Kay, 2008; Rideout et al., 2010; Sanders, 2006; Tallvid et al., 2015). On the other hand, females may be more likely to use the computer for communication (email, social networking) than males (Rideout et al., 2010). Kay and Lauricella (2011b) also observed that female undergraduate students were more likely to engage in on-task laptop behaviours compared to males.

**Peer behaviour.** Some researchers have observed that peer behaviours with mobile devices can have a significant impact on surrounding students in class. Aguilar-Roca et al. (2012), in their study of undergraduate students, explained that a major distraction was the sound produced from keyboard keys tapping. Fried (2008) added the clicking of keys and light emitted from the screen could lead to decreased efficiency and academic performance. Fang (2009) noted that phones were distracting in class because of the sounds from ringtones and vibrations. Jassawalla, Sashittal, and Malshe (2009) reported that undergraduate students were distracted when they could see other students in the classroom engage in cyber-slacking. Gerow et al. (2010) explained that other students might find it difficult to focus on their academics as the distracting activities of their peers are in competition with the lesson of the instructor.

**Instructional method.** The instructional method used to integrate mobile technology may influence the frequency of distracting behaviours. Fried (2008) explained that distraction caused by laptops might occur more in an unstructured, lecture-based environment, where students are not given explicit and technology-based learning tasks to
complete. She also argued that students need to be informed by instructors of the possible distractions posed by using laptops in class in order to control or avoid them. Ragan et al. (2014) claimed that free use of laptops by students during class offered unlimited opportunity for distraction. Kay and Lauricella (2011c) similarly argued that the absence of purposeful laptop integration during class can result in students engaging in distracting online activities.

Csikszentmihalyi’s (1990) explained that if a student were in a state of flow during the lesson, they might fall out of flow if the task became too challenging. Certain active instructional methods may increase flow (e.g., collaboration) while other passive methods (e.g., lecture and video presentations) might interrupt flow (Beard, 2015). Lindroth and Bergquist (2010) argued for a more concerted effort on the part of instructors to integrate mobile technologies into their class to prevent distracting behaviour. Kay and Lauricella (2011a) echoed this sentiment claiming that thoughtful and meaningful integration of laptops into the lesson should reduce distracting behaviour and engage students in more positive learning experiences.

**Restrictions.** The implementation of restrictions on mobile device use in the classroom can have an impact on both on-task and distracting behaviours associated with mobile device integration. Ragan et al. (2014) argued that allowing for unfettered access to laptops affords students the opportunity for an infinite source of distractions. Some teachers ban the use of mobile devices in their classroom to eliminate potentially distracting behaviour (Fang, 2009; Skiba, 2011). For example, a law school banned laptops from the classroom to ensure that students reduce device-related distractions and increase engagement in the actual lesson (Fang, 2009). However, a complete ban on the
use of laptops in the classroom would appear to be counter-productive given the research that espouses the advantages of laptop use (Fang, 2009; Skiba, 2011). Grimes and Warschauer (2008) offer a less drastic alternative to banning mobile devices where student input is sought on maximizing benefits and minimizing distractions.

Research Questions

Limited research has been conducted on the specific distracting behaviours that secondary school students engage in while using mobile devices in class. Furthermore, factors such as that could influence these distracting activities have not been examined in high school settings. Therefore, we addressed two research questions in this study:

1. What distracting activities do secondary school students engage in during class in a BYOD program?

2. What factors (gender, peers, instructional method) influence secondary school students’ participation in distracting activities in a BYOD program?

Method

Context

The study was conducted within three Canadian Accredited Independent Schools (CAIS) that had implemented Bring Your Own Device (BYOD) programs for at least seven years. School A, located in a suburban area in the province of British Columbia (population of 76,000) is a co-educational private school with about 500 JK to 12 students. School B, located in a rural area in British Columbia (population of 8,000), is a co-educational private school with about 480 grade 8 to 12 students. Finally, School C, located in a suburban area in the province of Quebec (population of 20,000) is a male-only school with about 570 JK to grade 11 students.
Exploring Factors that Influence 10

Participants

One hundred eighty-one secondary school students (126 males, 55 females) participated in this study. Students were 13 years old (n=5, 3%), 14 years old (n=17, 9%), 15 years old (n=46, 25%), 16 years old (n=53, 29%), 17 years old (n=40, 22%), or 18 years old (n=15, 8%). With respect to grade, 22% (n=40) were enrolled in grade 9, 30% (n=66) in grade 10, 30% (n=55) in grade 11, and 14% (n=26) in grade 12.

Research Design

This study used a mixed-methods approach to data collection leading to a convergent model of quantitative and qualitative data analysis (Creswell, 2014). Quantitative data (Appendix A, Items 1 to 5), collected from questions based on a nine-point semantic differential scale, provided an overall understanding of the frequency of various distracting activities displayed in BYOD classrooms. Qualitative data from an open-ended question (Appendix A, Item 6) helped to expand on the quantitative results with a thematic content analysis (Weber, 1990; Zhang & Wildemuth, 2009).

Data Collection

The dependent variables in this study, distractions, were assessed using two survey questions (Appendix A, Items 1 and 2) focusing on (a) the extent to which students engaged in on-task activities and (b) the frequency in which students involved in specific distracting activities (email, instant messaging, social media, playing games, surfing the web).

The independent variables, factors that could influence participation in distracting activities, were assessed with questions about gender, peer laptop behaviour, and instructional method (Appendix A, Items 3 to 5). A follow-up, open-ended question was
used to further explore students’ beliefs about how laptops could be made less distracting and more beneficial (Appendix A, Item 6).

**Data Analysis**

We conducted a frequency analysis to provide an overview of how often students engaged in distracting activities when using their laptops. Next, we completed frequency and/or mean’s comparison analyses to investigate factors that influence participation in distracting activities. Finally, we used content analysis to analyze student comments from the open-ended question. We attempted to understand each participant’s “social reality in a subjective but scientific manner” (Zhang & Wildemuth, 2009, p. 308). The first step of the content analysis procedure was to read all of the responses to gather a general impression. Next, we reviewed responses again to identify preliminary themes. Finally, we examined all ratings one more time to check for accuracy and overlapping themes.

**Procedure**

We contacted 22 CAIS school across Canada to ask whether they might be willing to participate in the study. Four CAIS schools (14% response rate) agreed to participate. When a student and their parent(s) consented to participate, they were sent a link to an online survey (Appendix A). Over a period of 11 weeks, 181 participants filled in the survey. Each survey took approximately 10 minutes to complete.

**Results**

**Type and Frequency of Distractions**

Students (n=149) responded to how often they engaged in on-task behaviours on their laptops during class. On a nine-point scale, the mean score was 6.6 ($SD = 1.9$) indicating that students were “frequently” on-task when using their laptops. Almost 80%
(n=114) of the students reported that they “often, frequently, almost always, or always” engaged in on-task laptop behaviours during class. Less than 10% of students (n=13) reported that they “never, almost never, or rarely” engaged in on-task behaviours.

Students rated how frequently they engaged in five distracting activities during class. E-mailing and surfing the web were the most frequent distracting activities with about two-thirds of students engaging in this behaviour “on occasion or regularly”. Just over half the students participated in social media activities “on occasion or regularly”. Finally, one-third of the students sent instant messages or played games “on occasion or regularly” when in class (Table 1).

Factors that Influence Distracting Behaviours

Gender. An independent t-test revealed that females ($M = 7.1, SD = 1.5$) claimed they engaged in on-task behaviours significantly more often than males ($M = 6.3, SD = 2.1$; $t=2.3, df=122, p < .05$). A MANOVA comparing females and males with respect to distracting activities was significant (Hotelling’s $T, F = 4.28, p < .005$). Females used social media (Cohen’s $d = 0.47, p < 0.05$) significantly more than males, whereas males played games significantly more than females during class (Cohen’s $d = 0.57, p < 0.01$). According to Cohen (1998, 1992) the effect sizes for mean differences between females and males in social media use and playing games are moderate. There were no significant gender differences for sending emails, instant messaging or surfing the web (Table 2).
Peer distraction.  On a nine-point scale, the mean score for how often a student was distracted by another student’s laptop was 3.7 ($SD = 1.8$) indicating that this happened “on occasion”. Over 50% of the students ($n= 94$) noted that they were “never, almost never, or rarely” distracted by a peer’s laptop. One third of the students ($n=60$) were distracted by a peer’s laptop “on occasion or sometimes”. Finally, 15% ($n=27$) were distracted “often, frequently, almost always, or always” by another student’s device.

Instructional method. Students were asked how often they were distracted and started using their laptop when certain instructional methods were used in class (Appendix B, Item 5). As indicated in Table 3, over 70% of students reported that they were distracted “on occasion or regularly” and used their laptops when they were doing independent work. About half of the students responded that they were distracted “on occasion or regularly” when engaged in group work or watching a lecture. Almost one-third of students responded that they were distracted “on occasion or regularly” during student presentations.

Insert Table 2 about here.

Insert Table 3 about here.
Making Mobile Devices Less Distracting / More Beneficial

We asked students how they could make laptops less distracting and/or more beneficial in the classroom (Appendix B, Item 6). As indicated in Table 4, five themes emerged from the 217 comments offered: restrictions, teacher impact, no change needed, self-control, and better software. The most frequent suggestion (97 comments) was that teachers needed to implement more restrictions including stricter supervision during class, blocking certain websites, only using laptops when needed, and limiting Wi-Fi access.

Sample suggestions from this theme included:

“Really bare down on laptops and make sure no one is using them [inappropriately] and if they are take them away, unless they are doing something productive.”

“Online restrictions to some websites would be efficient in a theoretical work ethic sense, but the students would be irritated by these limitations.”

“Being supervised when using them and the teacher supervising your screen.”

“I think not making Wi-Fi readily available to students while in class would definitely make everyone more productive.”

“The teacher having the students completely closing their devices during lessons, otherwise, there really is no way to stop it.”

A number of students (27 comments) thought that teacher impact was germane and better training and integration were required. Specific suggestions were:

“Technology could be more useful in class if teachers understood how to use it properly. Along with this, digital device use could be more beneficial if teachers knew what the opportunities for distraction are and could avoid them.”

“Have specific instructions, including where to go and what to do, to keep students more on task.”
“Have a mandatory limit on what needs to be done by the end of the class to ensure people are pushed to work to get the minimum done.”

“Have more engaging activities that can actually keep students focused instead of making them so bored that they want to shop or play games or surf online.”

“If the activities/assignments done in class were more interactive within the laptop, it would be harder to get off topic surfing the web since you have to be paying attention to what is happening on your screen.”

On the other hand, 20% of the comments suggested that students were fine with laptop use way it was. Sample responses were:

“I'm not sure. They’re pretty beneficial.”

“I do not really think you can, because they are already quite beneficial; If you are using them a lot in the class they are already being used to the full potential.”

“I don’t know if they can be more beneficial. It’s just using them at the appropriate times.”

“I like them the way they are, they force the student to be responsible and smart about his workload.”

“Nah I like them the way they are, they force the student to be responsible and smart about his workload.”

About 10% of the comments indicated that more self-control was needed to limit distractions and maximize benefits. Representative responses included:

“The students need to make the choice: do I stay on topic, or do I go on Facebook? And then they can pay the price for their actions. If they are constantly distracted and cannot multi-task they will see it reflected in their effort grades as well as class grade. I believe it is up to the student to have the moral strength to know when and when not to be on Facebook or watching videos.”

“Personal willpower to only open tabs needed or documents in use.”

“Stop messing around and stay on task.”

“Laptops are already beneficial. The challenge is if a person decided to use the laptop for its benefits instead of a distraction.”
"If a student does not want to work then you cannot force them to work. It’s like the expression: you can bring a horse to water but you can’t make him drink."

"[We need to] control ourselves."

Finally, just over 5% of the comments referred to the need for better software tools. Sample responses included:

"I think if we could turn questions that are asked during class into a poll which can be voted instantaneously and the results shown in front of all the students."

"Make use of extra programs such as Photoshop for projects, iMovies, etc."

"[We need] more online tools that would allow the class to collaborate online."

"Have the textbooks on them [laptops] so that we cannot lose them and they are less heavy in our bags."

**Discussion**

The purpose of this study was to examine the type, frequency, and potential influences of distracting activities that secondary school students engage in while using mobile devices in BYOD programs. Before discussing distractions, though, it is important to note that eight out of ten students reported that they were on-task “often or regularly” while using their mobile device in class. While secondary students participate in a number of distracting behaviours, their primary focus is to use mobile devices to achieve the learning goals or tasks set out in class. These students appear to be more on-task when using mobile devices than their higher education peers. Although Kay & Lauricella (2011c) noted that university students reported being on-task 80 to 90% of the time, two other studies reported on-task rates at about 50% for higher education students (Awwad et al., 2013; Ragan et al., 2014). There are at least two plausible reasons why this difference might exist. First, secondary schools classes are typically much smaller compared to those
in colleges or universities, and therefore distracting activity is more easily detected by the instructor. Second, a more structured set of external “school” rules that govern younger secondary school students are generally not applicable or regimented for older higher education students.

**Type and Frequency of Distractions**

While claiming to be on task most of the time, one-third to two-thirds of secondary school students reported that they engaged in a wide range of distracting activities while on their mobile devices during class. The shifting of attention between on-task and distracting activities, even if it occurs occasionally, can lead to decrease in performance due to the brain having to switch tasks, establish priorities, re-focus and re-engage in learning (Bowman et al., 2010; Judd & Kennedy, 2010; Kraushaar & Novak, 2010). Therefore, the absolute time that a student is on- or off-task may not be as critical as the act and cognitive cost of shifting attention from learning tasks to distracting behaviour.

Based on a thorough review of the literature, five distractions were examined including email, surfing the web, social media, instant messaging, and playing games. Email was the most cited distractions, with two-thirds of the students reporting that they used it “on occasion or regularly.” This result is inconsistent with previous results in higher education. Junco (2012b) and Kay and Lauricella (2014) reported the frequency of using email during class at 10% and 35% respectively. Students in this study, though, did not articulate why emailing in class was prevalent. Turkle (2011) proposed that email has become so commonplace that students do not see it as a distraction or prohibited activity. It is also possible that email was the most frequently reported distraction, because it can be
used for both academic and non-academic purposes, consequently most schools do not restrict its use through security firewalls.

Surfing the web was the second most frequently reported distraction. Nearly two-thirds of students reported surfing the web during class “on occasion or regularly.” This result is somewhat inconsistent with research in higher education where surfing the web was not as frequent (Kay & Lauricella, 2014; Ragan et al., 2014). Some students explained that searching the web was initially used for academic reasons, but if they were bored, they would surf for personal reasons. Because searching the web is used by students for both learning and recreation, there is the potential for increased risk of distraction.

Use of social media was the third most frequent distraction pursued by secondary school students during class – about half engaged in this activity “on accession or regularly”. It is somewhat surprising, given the teenage demographic, that nearly half of the students reported “never or rarely” using social media during class. Social media use might be limited by school firewalls and small-class supervision at the secondary school level, thereby curbing student use during class. One would anticipate, then, more frequent use of social media in higher education classes given that restrictions and blocking are atypical. Social media distractions during class, though, are reported less often in higher education. Ragan et al. (2014) reported social media use at 20%, Junco (2012b) at 28%, Aguilar-Roca et al. (2012) at 40%, and Kay and Lauricella (2014) between 40 and 50%. More detailed research, perhaps in the form of interviews or focus groups, is needed to understand the dynamics of social media use in classroom settings.

Instant messaging was a distraction for one third of secondary school students in the present study “on occasion or regularly”. The frequency of instant messaging during
class is similar to that reported by Junco (2012b) but far less than the 60% noted by Kraushaar and Novak (2010). Lower rates of instant messaging during class may reflect a relatively recent societal shift toward using social media tools and texting.

Finally, playing games was a distracting activity for only three out of ten students “on occasion or regularly”. This result is somewhat consistent with previous studies in higher education. For example, Kay and Lauricella (2014) reported 80% of higher education students never or rarely played games during class. Ragan et al. (2014) added that students played games only about 8% of the time during class. On the other hand, Fried (2008) reported that students played games 25% of the time, and Tallvid et al. (2015) observed game playing by students 23 - to 45% of the time. The infrequent use of playing games in secondary school is most likely explained by the use of the web filters to block access. In addition, smaller class sizes in secondary schools may facilitate supervision and subsequent restriction of game playing activity.

Factors that Influence Distracting Behaviours

**Gender.** Gender appears to have a moderated impact on participation in distracting behaviour. Females reported engaging in social media/networking more frequently than males and males engaged more frequently in gaming. These results are consistent with previous research in higher education (Barker & Aspray, 2006; Kay, 2008; Rideout et al., 2010; Sanders, 2006; Tallvid et al., 2015). On the other hand, no significant differences between males and females were found for email, surfing the web, or instant messaging. Differences in females’ social media use and males’ gaming behaviours have also been reported for college and university students (Barker & Aspray, 2006; Kay, 2007; Rideout et al., 2010).
Peer distractions. In the current study, over 50% of secondary school students were “never or rarely” distracted by a peer’s device. Furthermore, no student mentioned this type of distraction as being a problem in the open-ended question responses. However, previous research in higher education has reported that mobile device activity in class can have a significant and negative impact on surrounding students (Aguilar-Roca et al., 2012; Fang, 2009; Fried, 2008; Gerow et al., 2010; Jassawalla et al., 2009). It is possible, as stated earlier, that the small-class, highly supervised culture of the secondary school classroom might discourage students from engaging in highly distracting activities, the kind that might capture the attention of their peers.

Instructional method. In this study, instructional method had an effect on the frequency of distracting behaviours. Four standard teaching approaches were assessed including independent work, group activities, lectures, and student presentations. Independent work assigned to students so they can actively construct meaning and apply knowledge has been touted as a highly effective way to learn (e.g., Hattie, 2012; Petty, 2009; Prensky, 2010). Somewhat surprisingly, students were most distracted when they were asked to complete independent work, with almost 85% reporting that they engaged in distracting activities “on occasion or regularly”. Students commented that minimal teacher supervision occurred during independent, so they were free to surf the web, check email, or use social media for personal reasons. This finding is consistent with results reported by previous studies on structured and unstructured class environments with laptop use (Kay & Lauricella, 2011c; Ragan et al., 2014). For example, Ragan et al. (2014) argued that unrestricted use of laptops can provide students with an unlimited source of distraction. Likewise, Kay and Lauricella (2011c) noted that unstructured integration of
laptops could lead to students toward self-distracting activities. In summary, a constructivist approach to learning involving independent work may not be effective if it is not thoughtfully constructed, organized, and challenging.

Considerable evidence suggests that collaborative learning is an effective approach to teaching and learning (e.g., Hattie, 2012; Petty, 2009; Prensky, 2010). One would expect, then, that secondary school students would be engaged and focussed when learning with mobile devices in a group work scenario. However, over half of the students reported being distracted “on occasion or always” during group work. Some students explained that they would socialize while working with their peers. Other students noted that they would finish the assigned work in less time and then surf the web or use social media. It is possible that the appropriate structure, timing, and scaffolding required for effective collaborative learning was not robust enough to keep this age group on task, especially when the temptation of distracting internet activities was readily available.

Passive learning through lectures has been widely cited as a less effective teaching approach in secondary schools (e.g., Hattie, 2012; Petty, 2009; Prensky, 2010). One might expect student attention to shift toward distracting activities during a long lecture. While some students engaged in distracting behaviours during lectures, over 50% reported “never or rarely” being distracted by their mobile devices. The small class culture of feeling supervised may have played a role. Unlike independent or group work, the teacher’s focus would most likely be directly on the students. Additionally, students explained that during lectures they used their mobile devices to take notes or not at all. It may have been difficult to simultaneously take notes and engage in distracting activities. Obviously, distractions would be limited if a student chose not to use his/her laptop.
Finally, 70% of students reported “never or rarely” being distracted during student presentations. Student presentations are similar to lectures in terms of teaching philosophy – a relatively passive communication of information. However, a few students explained that they would not use their laptops during student presentations out of respect for their peers. If they were presenting to the class, they certainly would not want to see other students distracted by their laptops.

**Making Mobile Devices Less Distracting / More Beneficial**

Secondary students offered five suggestions about to reducing distractions and maximizing the benefit of using mobile devices: restrictions, teacher impact, no change needed, and better software. Almost half the students recommended that tighter external restrictions were necessary to reduce distracting behaviours, whereas only 8% suggested that more self-control was the answer. Perhaps secondary student recognize that, on average, they are unable to control self-distracting activities and need strictly enforced regulations and policies. However, if strict controls are enforced at the secondary school level, distractions could be a more serious problem when students participate in less controlled higher education settings.

Interestingly enough, the second most frequent response to reducing distractions and increasing benefits was to improve the quality, structure and meaningfulness mobile device integration. This finding is consistent with student feedback on the impact of instructional method, and their asking for improvements in planning, organization, clarity of directions, and engagement. As Kay and Lauricella (2014) noted, meaningful, relevant and engaging use of mobile devices to attain learning outcomes, should naturally limit distractions. Improving the quality of technological integration may also address self-
control challenges as students will be less likely to stray from interesting, authentic, well-planned lessons.

**Educational Implications**

There are several educational implications worth considering based on the results of this study. First, while students may be on task 80 to 90% of the time, they will engage in distracting behaviours if lessons are not well planned, organized, challenging, and engaging. Mobile devices have considerable potential to help improve learning, but they also provide readily available opportunities for self-distraction and entertainment. Second, while self-control is may be the optimal solution to moderating distracting behaviours, the majority of secondary students claim that restrictions from school and teacher are needed to limit distracting activities. Teachers need to actively monitor student behaviour when using mobile devices in class in order to maximize learning. Finally, gender appears to play a role in the type but not the frequency of distracting behaviours engaged in during class.

**Limitations and Future Research**

Based on the findings from this study, there are several opportunities for guiding future research. First, while a survey method provides a preliminary understanding of distracting activities with mobile devices in secondary school classroom, future studies should use qualitative methodology in the form of interviews and focus groups to understand the dynamics and catalysts of distracting behaviours. Second, a more detailed description and analysis of instructional activities needs to be conducted and analyzed to understand how to better implement technology and limit distractions. For example, it is important to link individual lesson plan activities to distracting technology-based behaviours. Third, a more balanced scale assessing both positive learning experiences and
distraction would help provide a more comprehensive understanding of when learning is minimized or maximized. Fourth, instructors need to be part of the overall analysis of distractions. Teachers can provide insights about context and pedagogy that would inform data analysis and interpretation of the results. Finally, monitoring actual activity on a mobile device with tracking programs like RescueTime©, rather than relying on students recall and perceptions would provide a more precise measure of beneficial and distracting activity.

References


Table 1

Frequency of Distracting Activities Engaged in During Class (n=146)

<table>
<thead>
<tr>
<th>Item</th>
<th>Mean</th>
<th>SD</th>
<th>Never</th>
<th>On Occasion</th>
<th>Regularly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Email</td>
<td>5.1</td>
<td>2.1</td>
<td>36%</td>
<td>23%</td>
<td>41%</td>
</tr>
<tr>
<td>Surf the Web</td>
<td>4.7</td>
<td>2.4</td>
<td>36%</td>
<td>25%</td>
<td>40%</td>
</tr>
<tr>
<td>Social Media/Networking Sites</td>
<td>3.9</td>
<td>2.3</td>
<td>48%</td>
<td>27%</td>
<td>25%</td>
</tr>
<tr>
<td>Instant Message</td>
<td>3.1</td>
<td>2.0</td>
<td>68%</td>
<td>17%</td>
<td>15%</td>
</tr>
<tr>
<td>Play Games</td>
<td>2.7</td>
<td>1.9</td>
<td>70%</td>
<td>19%</td>
<td>11%</td>
</tr>
</tbody>
</table>

1 Nine point Likert Scale (1 – Never to 9 – Always)
2 Includes Never, Almost Never, and Rarely
3 Includes On Occasion, and Sometimes
4 Includes Often, Frequently, Almost Always, and Always
Table 2

Gender Differences in Frequency of Distracting Activities during Class (n=141)

<table>
<thead>
<tr>
<th>Measure</th>
<th>Males M</th>
<th>SD</th>
<th>Males M</th>
<th>SD</th>
<th>Cohen’s d</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Email</td>
<td>4.9</td>
<td>2.1</td>
<td>5.5</td>
<td>2.1</td>
<td>0.28</td>
<td>2.2</td>
</tr>
<tr>
<td>Instant Messaging</td>
<td>3.0</td>
<td>2.1</td>
<td>3.4</td>
<td>1.9</td>
<td>0.20</td>
<td>1.6</td>
</tr>
<tr>
<td>Social Media</td>
<td>3.5</td>
<td>2.3</td>
<td>4.6</td>
<td>2.2</td>
<td>0.47</td>
<td>6.5 *</td>
</tr>
<tr>
<td>Playing Games</td>
<td>3.0</td>
<td>2.0</td>
<td>2.1</td>
<td>1.4</td>
<td>0.57</td>
<td>8.7 **</td>
</tr>
<tr>
<td>Surfing the Web</td>
<td>4.8</td>
<td>2.4</td>
<td>4.6</td>
<td>2.3</td>
<td>0.09</td>
<td>0.3</td>
</tr>
</tbody>
</table>

1 Nine point Likert Scale (1 – Never to 9 – Always)
2 Includes Never, Almost Never, and Rarely
3 Includes On Occasion, and Sometimes
4 Includes Often, Frequently, Almost Always, and Always

** p < 0.01
** p < 0.05
### Table 3

Frequency of Distraction as a Function Instructional Method

<table>
<thead>
<tr>
<th>Item</th>
<th>Mean</th>
<th>SD</th>
<th>Never</th>
<th>On Occasion</th>
<th>Regularly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent Work</td>
<td>4.8</td>
<td>2.2</td>
<td>27%</td>
<td>36%</td>
<td>36%</td>
</tr>
<tr>
<td>Group Work</td>
<td>4.0</td>
<td>2.2</td>
<td>47%</td>
<td>30%</td>
<td>23%</td>
</tr>
<tr>
<td>Lecture</td>
<td>3.8</td>
<td>2.4</td>
<td>52%</td>
<td>23%</td>
<td>25%</td>
</tr>
<tr>
<td>Student Presentation</td>
<td>3.0</td>
<td>2.1</td>
<td>69%</td>
<td>17%</td>
<td>13%</td>
</tr>
</tbody>
</table>

1Nine point Likert Scale (1 – Never to 9 – Always)
2Includes Never, Almost Never, and Rarely
3Includes On Occasion, and Sometimes
4Includes Often, Frequently, Almost Always, and Always
### Table 4

**Comments How to Make Laptops More Beneficial and/or Less Distracting (n=217)**

<table>
<thead>
<tr>
<th>Theme</th>
<th>Sub-Theme Label</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restrictions</td>
<td>Stricter supervision in class</td>
<td>34</td>
<td>16%</td>
</tr>
<tr>
<td></td>
<td>Block websites</td>
<td>33</td>
<td>15%</td>
</tr>
<tr>
<td></td>
<td>Only use when needed</td>
<td>21</td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td>Limit Wi-Fi Access</td>
<td>9</td>
<td>4%</td>
</tr>
<tr>
<td>Teacher Impact</td>
<td>Improve laptop integration</td>
<td>43</td>
<td>20%</td>
</tr>
<tr>
<td></td>
<td>Better teacher education on laptop use</td>
<td>9</td>
<td>6%</td>
</tr>
<tr>
<td>No Change Needed</td>
<td>Fine as they are already / no problem</td>
<td>38</td>
<td>18%</td>
</tr>
<tr>
<td>Self-Control</td>
<td>Self-control, restraint, freedom to choose</td>
<td>18</td>
<td>8%</td>
</tr>
<tr>
<td>Better Software or Apps</td>
<td>Access to specific apps</td>
<td>9</td>
<td>4%</td>
</tr>
<tr>
<td></td>
<td>E-copies of the textbook</td>
<td>3</td>
<td>1%</td>
</tr>
</tbody>
</table>
Appendix A - Student Survey

Distractions
1. How often do you engage in on-task activities during class?

2. The following questions ask about your activities on the laptop during class.
   a. Email
   b. Instant message
   c. Social media/networking
   d. Play games (online/offline)
   e. Surf the web

Factors that Could Influence Distractions
3. Gender?

4. In a given class, how often are you distracted by another student’s laptop activity? (Never, Almost Never, Rarely, On Occasion, Sometimes, Often, Frequently, Almost Always, Always)

5. In a given class, how often are you distracted and start using your laptop when the following instructional methods are used? (Never, Almost Never, Rarely, On Occasion, Sometimes, Often, Frequently, Almost Always, Always)
   a. Lecture
   b. Independent work
   c. Group work
   d. Student presentation

Open-Ended Follow-Up Question
6. How could you make laptops less distracting / more beneficial in class?