

## **GENDER DIFFERENCES IN THE USE OF LAPTOPS IN HIGHER EDUCATION: A FORMATIVE ANALYSIS**

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### **ABSTRACT**

Over the past 18 years, a number of large scale reviews of the literature have documented that gender differences in computer attitudes, ability, and use tend to favor males. Since the use of laptops in higher education classrooms is increasing, it is important to examine whether this use is disproportionately advantageous to males and disadvantageous to females. The purpose of this study was to explore gender differences in the use of laptops in higher education classrooms. Two key areas were examined: on-task behaviors (note-taking, academic activities, instant messaging) and off-task behaviors (e-mail, instant messaging, games, movies, distractions). With respect to on-task behaviors, females reported significantly more note-taking and participation in academic laptop-based activities. No gender differences were observed with respect to instant messaging for academic purposes. Regarding off-task behaviors, females were more distracted by their peers' use of laptops than males, whereas males reported that they played significantly more games during class. Recommendations for future research include expanding the breadth of off- and on-task behaviors assessed, exploring the role of teaching strategies, and focusing on learning performance.

### **INTRODUCTION**

Recent research suggests that there is an increased trend toward using laptops in higher education (e.g., Arend, 2004; Demb, Erickson, & Hawkins-Wilding, 2004;

Finn & Inman, 2004; Hyden, 2006; Kay & Knaack, 2005; McVay, Snyder, & Graetz, 2005; Wurst, Smarkola, & Gaffney, 2008). Studies have focused on the impact of laptops on communication, attitudes, achievement, and distractions. To date, though, limited systematic research has been conducted on gender differences and the use of laptops in higher education (e.g., Finn & Inman, 2004; Kay, 2006; Mitra, Lenzmeier, Stefenmeier, Avon, Qu, & Hazen, 2000). It is important that gender differences are explored to help avoid potential inequities that laptops might introduce. The purpose of this study was to explore the impact of gender on the use of laptops in higher education.

### **Gender Differences and Computers**

In 1992, Kay reviewed 36 studies on gender and computer related behaviors. While there were clear measurement concerns regarding the assessment of gender differences in computer ability, attitude, and use (e.g., Kay, 1992, 1993, 1994), the overall picture indicated that males had more positive attitudes, higher ability, and used computers more. Five years later, a meta-analysis by Whitley (1997) revealed that the imbalance between males and females continued to exist with respect to computer attitudes. Males had greater sex-role stereotyping of computers, higher computer self-efficacy, and more positive affect about computers than females. More recent reviews of the literature (AAUW, 2000; Barker & Aspray, 2006; Kay, 2008; Sanders, 2006) indicate that differences between males and females may be lessening somewhat, although male dominance is still prevalent with respect to attitude, ability, and use, particularly in higher education.

### **Laptops and Gender Differences**

Studies examining gender differences and the use of laptops have focused on three main attributes: attitude, ability, and use. With respect to attitudes, Mitra et al. (2000) reported that after a 4-year laptop program, males were significantly more positive about computers than females. On the other hand, Barak, Lipson, and Lerman (2006) and Kay (2006) reported no significant differences between males and females with respect to thoughts about laptops (cognitive attitudes) and/or feelings (affective attitudes).

Only one study could be found analyzing gender differences in ability with respect to laptop use in higher education. Kay (2006) observed that males, prior to enrolling in a pre-service teacher laptop program, reported having significantly greater skills than females in higher level computer activities (e.g., operating systems, databases, creating web pages, and programming), but not in basic office skills (e.g., word processing, spreadsheets, e-mailing). Interestingly, gender differences all but disappeared after all students completed the 8-month program.

The greatest number of studies on gender and laptops appear to have targeted computer use. The results, to date, have been mixed. Ching, Basham, and Jang

(2005) and Mitra et al. (2000) noted that males use computers (including laptops) more than females. Finn and Inman (2004) observed that males interact with the Internet, spreadsheets, presentation software, and games significantly more often than females, but word processing and e-mailing are gender neutral. Kay (2006) reported no significant differences between males and females in the use of laptops for communication, cooperative work, planning, entertainment, production, and multimedia.

### **Purpose**

The purpose of this study was to explore gender differences in on- and off-task behaviors with respect to laptop use in higher education classrooms. Specifically, two key research questions were addressed:

1. To what extent do males and females differ with respect to on-task laptop-related behaviors during class?
2. To what extent do males and females differ with respect to off-task laptop-related behaviors during class?

## **METHOD**

### **Context**

The study was conducted at a small university located in a large metropolitan area. All students and faculty at this institution were issued laptop computers. Students from this study were enrolled in one of two social science courses: Issues in the Family or Social and Political Philosophy. The main strategy of content delivery was a traditional lecture using a PowerPoint presentation. In addition, all class activities, notes, and PowerPoint presentations were posted on a Learning Management System (LMS). Compared to the majority of previous laptop-based studies where a lecture format was the dominant teaching strategy (e.g., Demb et al., 2004; Fried, 2008; Grace-Martin & Gay, 2001; Hembrooke & Gay, 2003; Lindorth & Bergquist, 2010; Wurst et al., 2008), a concerted attempt was made to meaningfully integrate the laptop into the curriculum. Sample in-class laptop-based activities included online surveys (e.g., assess gender roles, outlook on family issues), web-based research on assigned topics (e.g., social factors in historical perspective), interactive case studies to improve communication skills, creation of family genograms using online charting software, viewing online videos, reviewing published articles, consultation and discussion of websites (e.g., hate speech), and online philosophy games (e.g., philosophersnet.com).

### **Sample**

The sample consisted of 177 higher education students (89 males, 88 females), in their first ( $n = 74$ ), second ( $n = 59$ ), third ( $n = 30$ ), or fourth year ( $n = 13$ ) of

study. Seventy-five percent ( $n = 132$ ) of the students were born in Canada and 86% ( $n = 153$ ) reported that English was their first language. Students were enrolled in social science ( $n = 108$ ), business ( $n = 43$ ), engineering ( $n = 11$ ), science ( $n = 12$ ), or health science ( $n = 3$ ). Twenty-four of the 177 students did not have English as their first language. The average grade of first year students before they entered UOIT was 78.9% ( $SD = 6.3$ , range 65 to 90). The average grade for second- to fourth-year students was 74.6% ( $SD = 7.8$ , range 59 to 90). Almost 85% ( $n = 149$ ) of the students reported that they were either proficient ( $n = 94$ ) or very proficient ( $n = 55$ ) in using computers. Average daily use of laptop computers reported by students was 8.8 hours ( $SD = 4.4$ , range 2 to 16).

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## Data Sources

### *Descriptive Data*

Average grade, age, computer proficiency, number of years using the Internet, and hours per day using the laptop were collected from students to ensure that male and female groups were relatively homogenous (see Appendix A, Section A).

### *Laptop Behaviors—Survey Data*

Previous research on the use of laptops in higher education has focused on two main areas: on-task behaviors (e.g., Arend, 2004; Demb et al., 2004; Dickson & Segars, 1999; Mitra & Steffensmeier, 2000) and off-task behaviors (e.g., Bhawe, 2002; Hembrooke & Gay, 2003; Rapp, 2006). Therefore, this study focused on these same behaviors. *On-task laptop behaviors* assessed in the study included taking notes, general in class activities, and instant messaging for academic purposes (see Appendix A, Section B). *Off-task behavior* examined in this study included non-academic communication (e-mail and instant messaging), watching movies, playing games, and distracting behaviors by others and self (see Appendix A, Section C). Internal reliability estimates ranged from 0.78 to 0.89 and construct, convergent, and content validity were reported to be acceptable. See Lauricella and Kay (2010) for a detailed discussion of reliability and validity for the scale used in this study.

### *Laptop Behaviors—Qualitative Data*

Students were asked two open-ended questions about (a) how were laptops helpful *during class time* ( $n = 241$  comments) and (b) how were laptops not helpful *during class time* ( $n = 125$ ) comments. All comments were categorized and rated independently by two people. Categories and sample comments are presented in Table 1 (positive comments) and Table 2 (negative comments). The coding system is presented in Appendix B. The rating scale used to assess comments ranged from  $-2$  to  $+2$  ( $-2$ , very negative;  $-1$ , negative;  $0$ , neutral;

Table 1. In-Class Benefits of Using Laptops—Sample Comments ( $n = 241$ )

Category	Sample comments
Taking Notes ( $n = 75$ )	"[Using] laptops is much easier and quicker for me to take notes." "My handwriting is atrocious, so it allows me to make notes that I can read later."
Focusing in class ( $n = 36$ )	"I think that the laptop is helpful in class because it allows students to follow along with the lecture." "Even though we get distracted at times, the laptop makes it easier to get back on track a lot easier."
Resources ( $n = 32$ )	"Good for quickly finding resources. Good for finding information related to course and others." "If you don't know what something means you can just look it up too."
Lecture notes ( $n = 28$ )	"It can be used to jot down notes in the actual lecture slides, and makes it easier to follow along."
Organization ( $n = 18$ )	"I find the laptop helpful to keep all of my notes organized." "Much better organized [with the laptop] than on paper."
Activities ( $n = 13$ )	"The laptops make it easier to view and do interactive things with the [professor]." "The ability to learn software in the classroom with your computer is a huge advantage."
Efficiency ( $n = 12$ )	"More work can be completed with the laptop." "You don't need to lug around research journals or waste paper, in science we always need access to them."
Communication ( $n = 9$ )	"When ever there is a guest lecture in any of my classes, [my] friends and I have a group MSN chat where we discuss what is talked about in the lecture. Then I save that chat for future reference." "If missed something the professor said, or need clarification, it allows me to instant message a classmate to confirm."
Sharing notes ( $n = 5$ )	"We can send each other notes if we miss something." "[With a laptop, it is]" easier to give notes to a friend if they have missed a lecture."
Learning technology ( $n = 4$ )	"It helped me to understand how to use a computer better."
Administration ( $n = 4$ )	"It also allows you to check the syllabus when needed for a date of an assignment or project rather than interrupting the class."
Special needs ( $n = 3$ )	"I have 'ADD' and I would be beside myself with the length of these courses if not for the laptops. I can distract myself, or multi-task to other things while listening to the lecture. And so I tend to catch more of the classes than I would otherwise."

Table 2. Sample Comments about In-Class Challenges to Using Laptops ( $n = 125$ )

Category	Sample comments
Distracting ( $n = 30$ )	<p>"The sound of people typing gets irritating, people around you are giggling and whispering about things on their screens."</p> <p>"Unfortunately, the allure of so many distractions on your personal laptop can get in the way of in-class learning."</p>
Communication ( $n = 25$ )	<p>"Once you start chatting [IM] its hard to get back to paying attention to the professor."</p> <p>"Also watching people use instant messaging right in front of you can easily take your attention away from the lecture."</p>
Games ( $n = 21$ )	<p>"You see everyone else playing games . . . and (like in many theories of crime in bad neighborhoods) you see this and you think: 'What's the point of me doing work if no one else is?'"</p> <p>"When a professor is talking about something that is not really important its easy to drift off and play a game."</p>
Movies ( $n = 9$ )	"I do find it kind of distracting when others are watching movies."
Focus ( $n = 8$ )	<p>"When lecture slides are posted online there is sometimes no need to pay attention."</p> <p>"[Laptops] take your focus off the teacher."</p>
Internet/web ( $n = 8$ )	"If the lecture gets boring and students are not involved, they will just surf the web."
Take notes ( $n = 7$ )	"I would prefer not to use the laptop as I am more comfortable to write hand notes."
Money ( $n = 5$ )	"[The] cost of laptop is too high compared to me going out and buy one."
Technology problems ( $n = 4$ )	"In many cases, internet goes down!"
Self-discipline ( $n = 3$ )	"It is a distraction if not used properly or with maturity and discretion."

1, positive; 2, very positive). Items where categories and/or ratings were not exactly the same were shared and reviewed a second time by each rater separately. Using this approach, inter-rater reliability estimates ranged from 96% to 98% for categories of benefits and challenges and 99% to 100% for numerical ratings of the positive or negative impact of laptop behaviors.

### Procedure

At the conclusion of the final class meeting, students were invited to participate in an anonymous, online survey (see Appendix A). Participation was voluntary and students could withdraw from the study at any time simply by closing the online survey. The instructor was unable to determine who chose to participate and data was not accessed until all marks for the courses were submitted. It took approximately 10-15 minutes to complete the survey. The total number of students in both courses was 521, resulting in an approximate coverage rate of 34%.

The impact (labeled total effect) of any one category of comments was calculated by multiplying the mean rating by the number of comments made. For example, in Table 1 the total effect of "Taking Notes" for males was calculated as 34 or a mean rating of 1.17 times 29 comments. The total effect of "Taking Notes" for females was 59 or a mean rating of 1.26 times 47 comments.

### Data Analysis

Two MANOVAs were run to assess gender differences in laptop behavior. Males and females were compared to determine potential differences in:

1. general sample population characteristics (age, grade, hours per day using the laptop, computer proficiency, and Internet use); and
2. on-task behavior (taking notes, general in-class academic activities, instant messaging for academic purposes) and off-task behavior (e-mail, instant messaging, watching movies, playing games, distracting behavior by other students, distracting behavior by self).

## RESULTS

### Sample Population Characteristics

A MANOVA comparing descriptive characteristics between male and female populations was significant (Hotelling's  $T^2$ ,  $F = 5.15$ ,  $p < .001$ ). Males and females were not significantly different with respect to age, academic average, and hours per day spent using the laptop (see Table 3). However, males reported significantly higher computer proficiency levels ( $p < .001$ , Cohen's  $d = 0.71$ ) as well as starting to use the Internet earlier than females ( $p < .005$ , Cohen's  $d = 0.42$ ). According to Thalheimer and Cook (2002), the effect size (based on Cohen's  $d$ ) of

Table 3. Gender Differences in Descriptive Variables

Measure	Males		Females		Cohen's d	F
	M	SD	M	SD		
Age (years)	20.5	1.8	21.3	3.6	-0.28	3.35
Academic average <sup>a</sup>	78.4	5.8	79.5	6.5	-0.09	1.36
Hours per day on laptop	8.5	4.5	9.2	4.3	-0.15	1.37
Computer proficiency <sup>b</sup>	3.4	0.7	2.9	0.7	0.71	18.33*
Years on internet	7.6	2.1	6.7	2.2	0.42	7.12**

<sup>a</sup>Percent

<sup>b</sup>Likert scale (1 = not at all proficient to 4 = very proficient).

\* $p < .001$ . \*\* $p < .005$ .

the gender differences for computer proficiency and years using the Internet is considered medium in magnitude (see Table 3).

### On-Task and Off-Task Laptop Behaviors from Survey Data

The MANOVA run to compare male and females with respect to on- and off-task laptops behaviors was significant (Hotelling's  $T^2$ ,  $F = 5.15$ ,  $p < .005$ ). With respect to on-task behaviors, females reported taking notes ( $p < .05$ , Cohen's  $d = -0.44$ ) and participating in class-related academic activities ( $p < .05$ , Cohen's  $d = -0.44$ ) significantly more often than males. According to Thalheimer and Cook (2002), the effect sizes for these differences were in the medium range. There was no significant difference between females and males with respect to academic use of instant messaging (see Table 4).

Regarding off-task laptop behaviors, males reported playing games ( $p < .005$ , Cohen's  $d = 0.43$ ) significantly more often than females during class. Females, on the other hand, reported being significantly more distracted by other's use of laptops during class ( $p < .05$ , Cohen's  $d = 0.45$ ). According to Thalheimer and Cook (2002), the effect sizes for these differences were in the medium range. There were no significant differences between males and females with respect to non-academic use of e-mail and instant messaging, watching movies, or being self-distracted by laptops computers during class (see Table 4).

### Helpful Laptop Behaviors—Qualitative Data

The ratings of the qualitative data suggest that females felt laptops were more helpful than males for note-taking, increasing focus, and communication. Both

Table 4. Gender Differences in On-Task and Off-Task Laptop Behaviors

Measure	Males		Females		Cohen's d	F
	M	SD	M	SD		
On-task behaviors						
Take notes <sup>a</sup>	5.43	2.20	6.31	1.74	-0.44	5.47*
Academic activity <sup>a</sup>	5.22	2.06	6.10	1.91	-0.44	6.20*
Instant messaging <sup>b</sup>	1.71	1.12	1.87	1.16	-0.14	0.38
Off-task behaviors						
E-mail <sup>a</sup>	2.68	1.86	2.76	1.93	-0.04	0.06
Instant messaging <sup>a</sup>	3.43	2.32	3.83	2.50	-0.17	0.90
Playing games <sup>a</sup>	1.22	1.37	0.65	1.30	0.43	5.87*
Watching movies <sup>a</sup>	0.23	0.72	0.24	0.83	-0.01	0.00
Distracted by others <sup>b</sup>	2.20	0.84	2.56	0.77	0.45	6.45*
Distracted by self <sup>b</sup>	2.79	0.72	2.96	0.72	-0.24	1.94

<sup>a</sup>(Percent of class – 0 - 0%, 2 = 1 to 25%, 4 = 26 to 50%, 6 = 51-75%, 8 = 76 to 100%)

<sup>b</sup>.Percent of class – 0 - 0%, 2 = 1 to 25%, 2 = 26 to 50%, 3 = 51-75%, 4 = 76 to 100%)

\* $p < .05$ .

frequency of comments and mean rating scores were higher for females than males in these three areas. Males, on the other hand, appeared to rate in-class activities as more appealing. Use of the laptop for accessing resources or lecture notes was thought to be helpful by both males and females. Using the laptop to increase efficiency, share notes, learn new technology, complete administrative tasks, and address special needs were reported relatively infrequently by males and females (see Table 5).

### Unhelpful Laptop Behaviors—Qualitative Data

Male and female students were similar in their comments about unhelpful laptop behaviors in class. While no obvious gender differences were observed in any single category of unhelpful laptop behaviors, the total impact of all negative behaviors was higher for females than males with respect to frequency and mean rating scores (see Table 6).

## DISCUSSION

The purpose of this study was to examine whether there are gender differences in on- and off-task laptop behaviors in higher education classrooms. Before addressing this question, it was important to establish that males and females did not differ with respect to any compounding variable that might influence laptop behaviors.

Table 5. Helpful Laptop Behaviors in Class—  
Males vs. Females (Rating of Qualitative Data)

Category	Males			Females		
	Mean rating	<i>n</i>	Total effect (Rating * <i>n</i> )	Mean rating	<i>n</i>	Total effect (Rating * <i>n</i> )
Taking notes	1.17 (0.47)	29	34	1.26 (0.44)	47	59
Focus	1.00 (0.00)	14	14	1.09 (0.29)	22	24
Resources	1.06 (0.44)	16	17	1.06 (0.25)	16	17
Lecture notes	1.00 (0.00)	12	13	1.07 (0.26)	15	16
Organized	1.00 (0.00)	7	7	1.09 (0.30)	11	12
Activities	1.11 (0.33)	9	10	1.00 (0.00)	4	4
Efficient	1.50 (0.55)	6	9	1.00 (0.00)	6	6
Communication	1.00 (n.a.)	1	1	1.11 (0.33)	9	10
Sharing notes	1.00 (0.00)	2	2	1.00 (0.00)	3	3
Learn tech.	1.00 (0.00)	3	3	1.00 (n.a.)	1	1
Admin.	1.33 (0.58)	3	4	1.00 (n.a.)	1	1
Spec. needs	1.50 (0.71)	2	3	1.00 (n.a.)	1	1
Total	1.12 (0.38)	110	117	1.13 (0.34)	136	154

### Potential Confounding Variables

Male and female sample populations were similar with respect to average age, academic grades, and hours per day on the laptop computer. Consequently, it is less likely that gender differences in this study are influenced by these variables. However, males did report higher levels of computer proficiency and Internet experience. One might speculate that computer prowess might give male students an edge over female students with respect to using laptops during class. This speculation was not supported as females tended to use computers more for academic activities than males.

### On-Task Behaviors

Both survey and qualitative data indicated that females used laptops significantly more than males for note taking in class. In addition, survey, but not qualitative data, suggested that females participate in academic-related activities significantly more than males. Even though males reported being more computer

Table 6. Unhelpful Laptop Behaviors in Class—  
Males vs. Females (Rating of Qualitative Data)

Category	Males			Females		
	Mean rating	<i>n</i>	Total effect (Rating * <i>n</i> )	Mean rating	<i>n</i>	Total effect (Rating * <i>n</i> )
Distracting	-1.23 (0.44)	13	-16	-1.24 (0.44)	17	-21
Communication	-1.30 (0.48)	10	-13	-1.33 (0.49)	15	-20
Games	-1.30 (0.48)	10	-13	-1.27 (0.47)	11	-14
Movies	-1.20 (0.45)	5	-6	-1.25 (0.45)	4	-5
Web	-1.00 (n.a.)	1	-1	-1.43 (0.53)	7	-10
Focus	-1.50 (0.58)	4	-6	-1.50 (0.58)	4	-6
Take notes	-1.00 (0.00)	2	-2	-1.60 (0.55)	5	-8
Money	-1.33 (0.58)	3	-4	-2.00 (0.00)	2	-4
Tech probs.	-1.00 (0.00)	3	-3	-2.00 (n.a.)	1	-2
Discipline	—	—	—	-1.33 (0.58)	3	-4
Total	-1.28 (0.45)	53	-68	-1.39 (0.49)	72	-100

proficient, it was females who seemed to benefit the most with respect to on-task laptop behaviors assessed. These results are somewhat inconsistent with previous research on gender differences and laptop use where males were reported to use computers more (Ching et al., 2005; Mitra et al., 2000) or as often as females (Finn & Inman, 2004). However, the results are consistent with previous research on gender differences and overall computer use. Females see computers more as tool to accomplish a specific task (Fiore, 1999; Mumtaz, 2001; Passig & Levin, 1999).

No gender differences were observed regarding the use of instant messaging as an academic tool. Since students did not use this tool very often, it is conceivable that the results may partially reflect a “floor” effect. It is also possible that gender differences are partially dependent on the type of tools used. Instant messaging as an academic aid may be equally appealing (or unappealing) to males and females.

### Off-Task Behaviors

Survey data suggested that males reported playing games significantly more often than females during class. This observation matches the result reported by Finn and Inman (2004). It is also consistent with previous research on gender and general computer use which suggests that males view computers more as a toy

than a tool (Fiore, 1999; Mumtaz, 2001; Passig & Levin, 1999). It should be noted that game playing in the current study was not reported very often. While some males may have participated in this off-task behavior when given the opportunity to use a laptop in class, the majority of students, male and female, did not play games. It is also worth noting that the qualitative data suggested that males and females found games to be equally distracting in class.

Although females engage in significantly more on-task behaviors than males, their academic pursuits in class may be partially hampered because they are significantly more distracted than males by other students' use of laptops during class. One explanation, although speculative at this point, might be that males are less distracted than females because males are engrossed in more enticing off-task behaviors. More research is needed to identify the precise sources of laptop-based distractions that females experience. Finally, it is important to note that being distracted by another student's or self-use of laptops, regardless of gender differences, was reported between 25% and 50% of the time during class. Distractibility appears to be a significant concern and worth investigating in future research.

The qualitative data suggested that while there was no single negative laptop behavior differentiating males and females, the cumulative impact of all potential distractions seemed to affect females more negatively than males. More research examining the impact of specific behaviors on a larger sample is needed to determine whether females are more vulnerable to pitfalls of laptop use in class.

### **Alternative Explanation**

In this study, it appears that females participate more than males when it comes to note-taking and in-class laptop-based activities. However, it is possible that females, regardless of the presence of a laptop, are more actively involved in higher education classrooms. While no specific research could be found on gender differences and note-taking behavior in a university context, a number of studies suggest that males participate more in traditional higher education classrooms than females (e.g., Canada & Pringle, 1995; Caspi, 2008; Younger, Warrington, & Williams, 1999). However, Caspi (2008) observed that females participated more in online discussion where a written format was used to communicate. It is conceivable that laptop computers provide a less intimidating forum for participation and thereby benefit females more. Further research is required to determine whether males and females behave differently in laptop-based classrooms than they would in traditional classrooms with respect to note-taking and participation.

### **Teaching Strategies and Gender Differences**

Previous research has reported that negative in-class laptop behavior is precipitated by the use of traditional lecture-based teaching methods (Demb et al., 2004; Fried, 2008; Grace-Martin & Gay, 2001; Hembrooke & Gay, 2003;

Lindroth & Bergquist, 2010; Wurst et al., 2008). If laptops are not actively integrated into a class, students will use them to distract and entertain themselves, especially when they are bored with the passive presentation of material. While a concerted effort was made in this study to integrate laptops into the curriculum, a lecture combined with a PowerPoint presentation was the primary method of content delivery. It is possible that off-task behavior increased during these presentations, a speculation that is supported by Skolnik and Puzo (2008). However, more systematic research is needed with respect to the impact of teaching strategy on laptop behaviors in the classroom. It is conceivable that gender differences could be eliminated if meaningful, active, and regular use of specific laptop-based strategies was the norm.

### **Caveats and Future Research**

This study is the first comprehensive effort to examine gender differences in the use of laptops in higher education classrooms. Data collection tools proved to be reliable and valid. Nonetheless, there were several areas in which the methodology and focus could be improved to guide future research.

First, the sample size, while relatively large, was composed of mostly social science and business students. Gender differences need to be evaluated on a wider range of subjects where the type of academic activities and software tools may be different. Second, the scale used could be expanded to assess a broader range of in-class laptop activities (e.g., databases, spreadsheets, learning objects, surveys). A more comprehensive scale would provide a wider spectrum with which to assess gender disparities. Third, it would be informative to collect qualitative data in the form of interviews or focus groups to gain a richer understanding of gender differences, specifically regarding the range of distractions that can be experienced. Fourth, it would be helpful to compare laptop-based to traditional classrooms with respect to off- and on-task behaviors. To date, it is unclear whether gender differences in higher education classrooms are unique to the laptop-based format. Fifth, the effect of teaching strategy on positive and negative laptop behaviors in class should be addressed. If laptops are systematically and meaningfully integrated into higher education, gender differences may disappear. Sixth, the impact of on- and off-task behaviors on learning performance needs to be examined. Even if males and females differ with respect to laptop behavior in class, it is unclear whether these disparities translate into differences in academic success. Finally, the information collected in this study is “self-report” data. It would be beneficial to validate this data with direct observations from an external source.

### **Summary**

Research on gender differences with respect to the use of laptops is limited in both quantity and quality of data collection. Data were collected using a reliable

and valid scale. Two key areas were examined: on-task and off-task behaviors. Females reported significantly more on-task behaviors than males (e.g., taking notes and academic activities). However, males and females did not differ with respect to use of communication tools for academic purposes. Male students were more distracted than female students with respect to playing games during class, while females were more distracted by their peer's use of laptops. Males and females did not differ regarding the use of communication tools for the purpose of recreational activities during class.

### APPENDIX A: Gender Differences in Laptop Behavior Survey

#### Section A. Descriptive Variables

1. What is your age?  
Under 18    18-22    23-30    31-39    40 or over
2. What is your gender?    Male    Female
3. If you are not a first-year student, what is your current academic average?  
< 60    60-70    71-80    81-90    90 or above
4. How many hours per day do you use your laptop computer (including in-class use)?  
0    1-4 hrs    5-9 hrs    10-14 hrs    > 15 hrs
5. Before enrolling at UOIT, how would you describe your proficiency in using computers?  
Not at all proficient (1)    Slightly proficient (2)    Proficient (3)  
Very proficient (4)
6. What year did you start using the Internet regularly? \_\_\_\_\_

#### Section B. On-Task Laptop Behaviors

1. How much of the lecture time in *this course* do you use the laptop to *take notes* or follow the lecture?  
0% (0)    1-25% (1)    26-50% (2)    51-75% (3)    76% to 100% (4)
2. How much of the lecture time in *other courses* do you use the laptop to *take notes* or follow the lecture?  
0% (0)    1-25% (1)    26-50% (2)    51-75% (3)    76% to 100% (4)
3. How much of the lecture time in *this course* do you use the laptop for *academic purposes* relating to *this class* (i.e., following lecture, doing in-class assignments or activities, viewing course outline, etc.)?  
0% (0)    1-25% (1)    26-50% (2)    51-75% (3)    76% to 100% (4)
4. How much of the lecture time in *other courses* do you use the laptop for *academic purposes* relating to *those classes* (i.e., following lecture, doing in-class assignments or activities, viewing course outline, etc.)?  
0% (0)    1-25% (1)    26-50% (2)    51-75% (3)    76% to 100% (4)

5. How much time do you spend using instant messenger for *academic purposes* while you are in your classes?  
 0% (0) 1–25% (1) 26–50% (2) 51–75% (3) 76% to 100% (4)

### Section C. Off Task Behaviors

1. How much of the lecture time in *this course* do you use the laptop for **email** of any kind (Hotmail, Yahoo, gmail, etc.) *for purposes other than this course*?  
 0% (0) 1–25% (1) 26–50% (2) 51–75% (3) 76% to 100% (4)
2. How much of the lecture time in *other courses* do you use the laptop for **email** of any kind (Hotmail, Yahoo, gmail, etc.) *for purposes other than this course*?  
 0% (0) 1–25% (1) 26–50% (2) 51–75% (3) 76% to 100% (4)
3. How much of the lecture time in *this course* do you use the laptop for **instant messaging** (msn, etc.) *for purposes other than the course*?  
 0% (0) 1–25% (1) 26–50% (2) 51–75% (3) 76% to 100% (4)
4. How much of the lecture time in *other courses* do you use the laptop for **instant messaging** (msn, etc.) *for purposes other than the course*?  
 0% (0) 1–25% (1) 26–50% (2) 51–75% (3) 76% to 100% (4)
5. How much of the lecture time in *this course* do you use the laptop to **play games**?  
 0% (0) 1–25% (1) 26–50% (2) 51–75% (3) 76% to 100% (4)
6. How much of the lecture time in *other courses* do you use the laptop to **play games**?  
 0% (0) 1–25% (1) 26–50% (2) 51–75% (3) 76% to 100% (4)
7. How much of the lecture time in *this course* do you use the laptop to **watch movies**?  
 0% (0) 1–25% (1) 26–50% (2) 51–75% (3) 76% to 100% (4)
8. How much of the lecture time in *other courses* do you use the laptop to **watch movies**?  
 0% (0) 1–25% (1) 26–50% (2) 51–75% (3) 76% to 100% (4)
9. How often are you **distracted by other people** using their laptops in class?  
 Never (1) Rarely (2) Sometimes (3) Frequently (4)
10. How often do you **distract yourself** by using the laptop in class by doing things such as msn, checking email, surfing the Web, etc?  
 Never (1) Rarely (2) Sometimes (3) Frequently (4)

**APPENDIX B:  
Coding Scheme for Qualitative Data**

Category	Criteria
<b>In-Class Helpful Behavior</b>	
Activities	Refers to student using laptop for in-class activity
Admin	Refers to use of laptop for checking some sort of admin issue (e.g., grades)
Communication	Refers to use of laptop for communicating (e.g., instant messaging, email)
Distraction	Refers to use of laptop as a distraction
Efficient	Refers to laptop making student class more efficient (e.g., more work can be completed, less paper is used)
Focus	Refers to increased focus or being able to follow the class along better
Learn tech	Refers to learning how to use technology better as a result of having laptop
Lecture notes	Refers to benefits of lecture notes
Organized	Refers to being more organized
Resources	Refers to the benefit of being able to look up resources in class
Special needs	Refers to laptop helpful student with special needs (e.g., ESL, ADHD)
Take notes	Refers to the benefit of being able to take notes
<b>In-Class NOT Helpful Behavior</b>	
Communication	Refers to use of laptop for communicating (e.g., instant messaging, email)

**APPENDIX B** (Cont'd.)

Category	Criteria
Discipline	Refers to the need for self-discipline
Distracting	Refers to use of laptop as a distraction
Focus	Refers to decreased focus or not being able to follow the class along better
Games	Refers to use of games
Movies	Reference to movies made
Take notes	Refers to taking notes
Tech problems	Refers to hardware or software issues
Web	Refers to use of the web during class
<b>Rating Scale</b>	
2	Positive comment that includes descriptors (adjectives and adverbs) or very strong positive words (e.g., love, excited, great, a lot, really) OR if there is an exclamation mark!
1	Positive comment without strong modifiers or positive outcome (e.g., increased feedback to teacher or students)
0	Neutral comment—no positive or negative value given in the comment
-1	Negative comment without strong modifiers or a negative outcome
-2	Negative comment that includes descriptors (adjectives and adverbs) or very strong negative words

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