Investigating how students use their laptop during class time and the potential facilitation and interference with academic success

uOttawa

University of Ottawa Research Opportunity Program Symposium

Stéphanie Manoni-Millar, Alexandre Gareau, Dr. Patrick Gaudreau

Laboratory for research on Achievement, Motivation, and Regulation of Action (LAMRA)

School of Psychology, University of Ottawa, Ottawa, ON, Canada

Introduction

OBJECTIVE:

To inform universities about the risks and benefits of wireless classrooms and how to help students better regulate electronic behavior to maximize learning.

LAPTOP BEHAVIOR AND WORKING MEMORY

- In-class multi-tasking is correlated with compromised understanding of material and low academic performance (e.g., Fried, 2008; Sana et al., 2013)
- Computers are a source of distraction, overload, and can interfere with students' ability to pay attention (e.g., Fried, 2008; Sana et al., 2013)
- However, not all time spent on laptop is necessarily bad for performance. Some behaviors might actually be useful for school performance (e.g., Gaudreau et al., 2014)
  - School related laptop (e.g., taking notes, looking for complementary material) can positively correlate with school achievement.
  - School unrelated laptop (e.g., browsing, shopping, social networking) can negatively correlate with school achievement.
- Students with lower working memory capacity generally have more difficulties with reading, mathematics, and writing (e.g., Garhercole, 2007; Sawason et al., 2012)

WHAT IS MISSING?

- It could be argued that cognitive abilities, like intelligence and working memory, might underlie the usage and the effect of laptop behaviors of university students (e.g., Ravizza et al., 2014)
- Working memory is the ability to retain task-relevant information that you have been exposed to (e.g., Baddeley et al., 1999; Sawason et al., 2012).
- Working memory has been shown to be a strong predictor of academic achievement (e.g., Garhercole, 2007; Sawason et al., 2012).
- School-related laptop behaviors might be positively associated with academic achievement only because such behaviors are emitted by those students with higher working memory capacity.
- School unrelated laptop behaviors during class time are associated with lower grades even after academic abilities and attendance were accounted for (e.g., Gaudreau et al. 2014). What still needs to be investigated is if laptop behaviors are correlated to achievement over and above other individual characteristics (e.g., working memory capacity).
- We hypothesized that school-unrelated laptop and school-related laptop behaviors would be negatively and positively associated with semester grade point average of university students, respectively. We hypothesized that these relationships would remain unchanged after controlling for working memory capacity.

Methods

THE PARTICIPANTS:

- 257 (75.1% female) university students from the University of Ottawa.
- The participants (mean age = 19.7) were ranging from first to fourth year: 1st year (61%) ,2nd year (22%), 3rd (6.9%), 4th (6.9%).
- Majority of students were studying in the social sciences.
- All students provided consent and received two points in their introduction to psychology class through the Integrated System of Participation in Research.

Methods

PROCEDURES:

- Participants answered a short questionnaire (e.g., Gaudreau et al., 2014) measuring how they use their laptop during their courses at the university.
- Participants completed two working memory tasks (e.g., Unsworth et al., 2005) to evaluate the extent to which they can remember information (i.e., words) after having been distracted by simple mathematical equations (e.g., 4/2 + 1 = 3) or reading problems (e.g., the tornado came out of nowhere and destroyed our raisin).
- Grades achieved in the semester were obtained from the registrar office for 200 participants who provided their consent.

Results

DESCRIPTIVE STATISTICS:

Behaviors	*M (SD)*	Frequency (%)	
		Very often	Very rarely
1. Do you take school-related notes on your laptop during class time?	4.03(1.82)	18.80	9.60
2. Do you search school-related complementary information on the web?	3.69(1.48)	18.00	8.60
3. Do you send school-related emails with your laptop during class time	2.50(1.35)	4.60	19.90
4. Do you navigate on websites that are not related to school work?	3.11(1.55)	14.20	15.30
5. Do you visit social networking sites?	3.16(1.66)	13.40	15.70
6. Do you use your laptop to watch videos/pictures?	2.44(1.60)	8.40	21.50
7. Do you do online shopping with your laptop?	1.81(1.34)	2.30	14.60
8. Do you chat on your laptop during class time?	2.23(1.41)	5.00	15.70
9. Do you play video games on your laptop during class time?	1.33(0.83)	0.40	10.00

Correlation between **total working memory** and **academic achievement**, r= .22 , p= .002.

Behaviors	Total Working memory	Academic Achievement
1. Do you take school-related notes on your laptop during class time?	r= -.03, p= .68	r= -.11, p= .14
2. Do you search school-related complementary information on the web?	r= .07, p= .24	r= .04, p= .61
3. Do you send school-related emails with your laptop during class time?	r= .01, p= .88	r= .10, p= .16
4. Do you navigate on websites that are not related to school work?	r= .05, p= .46	r= -.03, p= .72
5. Do you visit social networking sites?	r= .02, p= .72	r= -.09, p= .19
6. Do you use your laptop to watch videos/pictures?	r= .09, p= .15	r= -.02, p= .83
7. Do you do online shopping with your laptop?	r= .02, p= .73	r= -.16, p= .02
8. Do you chat on your laptop during class time?	r= .04, p= .55	r= -.04, p= .54
9. Do you play video games on your laptop during class time?	r= .04, p= .51	r= -.04, p= .53

MAIN ANALYISIS:

	Academic achievement				
	ΔF	ΔR^2	β	*t*	Sig.
Model 1	2.73	.03			
School Related laptop behaviors			.15	2.03	.044
School unrelated laptop behaviors			-.14	-1.82	.070

Results

Results of multiple regression predicting how laptop behaviors influence academic achievement over the effect of working memory ability.

	Academic achievement				
	ΔF	ΔR^2	β	*t*	Sig.
Model 1	9.73	.05			
Total working memory			.22	3.12	.002
Model 2	2.54	.03			
Total working memory			.22	3.18	.002
School related laptop behaviors			.14	1.90	.059
School unrelated laptop behaviors			-.13	-1.80	.073

Discussion

- The analysis showed that there is a **significant relationship** between school related laptop behaviors, as well as a **marginally significant** relationship between school unrelated behaviors and academic achievement when working memory capacity is controlled.
- The results demonstrate that there are other factors that determine academic achievement over and above working memory.
- Behavior regulation should be addressed in order to see more positive results of academic achievement.

Limitations

- The relatively small sample size makes it difficult to generalize to all students.
- The students who participated in the study are predominantly in social sciences. It would have to be tested with a wider range of students in different faculties to see how the effects can generalize to the population of university students.
- Grade point average is not the only indicator of academic achievement. Attaining personal goals should also be considered.

Future directions

- How students will use electronic devices once on the job market after university? How will it influence their job performance?

References

Baddeley, A. D., & Logie, R. H. (1999). Working memory: The multiple-component model. In A. Miyake & P. Shah (Eds.), *Models of working memory: Mechanisms of active maintenance and executive control* (pp. 28–61). Cambridge, England: Cambridge University Press.

Fried, C. B. (2008). In-class laptop use and its effects on student learning. *Computers & Education, 50*, 906-914.

Gathercole, S. (2007). Working Memory. In H. L. Roediger (Ed.), *Cognitive psychology of memory* (3rd ed., Vol. 2, pp. 33-52). Oxford: Elsevier.

Gaudreau, P., Miranda, D., & Gareau, A. (2014) Canadian university students in wireless classrooms: What do they do on their laptops and does it really matter? *Computers & Education, 70*, 245-255.

Ravizza, S. M., Hambrick, D. Z., & Fenn, K. M. (2014). Non-academic internet use in the classroom is negatively relatated to classroom learning regardless of intellectual ability. *Computers & Education, 78,* 109-114.

Sana, F., Weston, T., & Cepeda, N. J. (2013). Laptop multitasking hinders classroom learning for both users and nearby peers. *Computers & Education, 62*, 24-31.

Swanson, H. L., & Alloway, T. P. (2012). Working memory, learning, and academic achievement. In K. R. Harris, S. Graham & T. Urdan (Eds.), *APA Educational Psychology Handbook: Vol. 1. Theories, Constructs, and Critical Issues*. American Psychological Association Press: Washington, DC, US.

Unsorth, N., Heitz, R. P., Schrock, J. C., & Engle, R. W. (2005), An automated version of the operation span task. *Behavior Research Methods, 37*(3), 498-505.

Acknowledgements

This research was supported by a SSHRC Insight Grant to Patrick Gaudreau.

The University of Ottawa Undergraduate Research Opportunity Program (UROP) is acknowledged with great appreciation for this opportunity.

uOttawa

For Further information please contact:
Stephanie Manoni-Millar: smano086@uottawa.ca