

Note for instructors:

- If you make significant improvements/additions to this slide deck, I would love for you to share your improvements with me!
(waggonerdenton@psych.utoronto.ca)
- These slides provide a summary of some recent research on the use/access of technology (e.g., laptops, phones) during class time and study sessions.
 - This is *not* a comprehensive list of all research done in this area!
- The slides themselves have limited text on them, as they are meant to be 'ready to show' to students in the context of a lecture. However, I have included additional information (including full abstracts of key papers referenced) in the notes sections of the slides.
 - While the slides focus on *results*, I also highly recommend using this opportunity to discuss research methods, potential confounds, appropriate inference, etc.!

Additional Resources:

- For instructors (from the Learning Scientists):
 - Links to pro & con opinion pieces on cell phone use in the classroom:
<http://www.learningscientists.org/blog/2017/9/17/weekly-digest-77>
 - Guest post on Technology in the Classroom:
<http://www.learningscientists.org/blog/2017/9/5-1>
- For students (a wonderful article that includes the technology advice advocated here, as well as a lot more!):
 - Putnam et al. (2016). Optimizing learning in college: Tips from cognitive psychology. *Perspectives on Psychological Science*, 11, 652-660.
<https://uwaterloo.ca/psychology/sites/ca.psychology/files/uploads/files/howtosucceedinuniversity.pdf>

Making Informed Decisions: *Laptops, Smartphones, and Your Studies*





Laptop Use in the Classroom

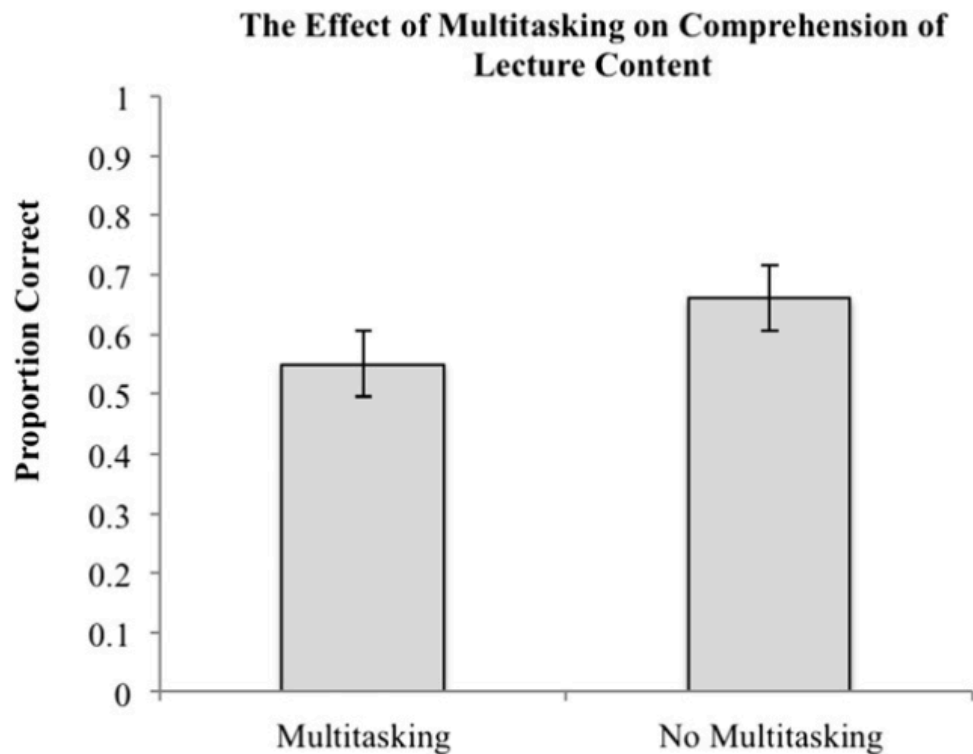


- Laptops are (*gasp!*) not always used solely for note-taking
 - Email, unrelated websites, videos, shopping, social media, etc.
- *School-unrelated* laptop use during class time has been associated with lower academic satisfaction, lower end-of-semester GPAs, and lower course performance relative to classmates (Gaudreau, Miranda, & Gareau, 2014)

Laptop Use in the Classroom: Multitasking

Sana, Weston & Cepeda, 2013

- Simulated classroom environment (45 minute ‘introduction to meteorology’ lecture)
 - Multitasking condition: given 12 online tasks similar to those that students regularly engage in (e.g., answering a question that can be found with a relatively quick Google search)
 - No multitasking condition: Just used their laptops to take notes
- Lecture was immediately followed by a comprehension test (both knowledge and application questions)



(Fig. 1 from Sana, Weston & Cepeda, 2013)

The multitasking students scored an average of **11% lower** on the test!

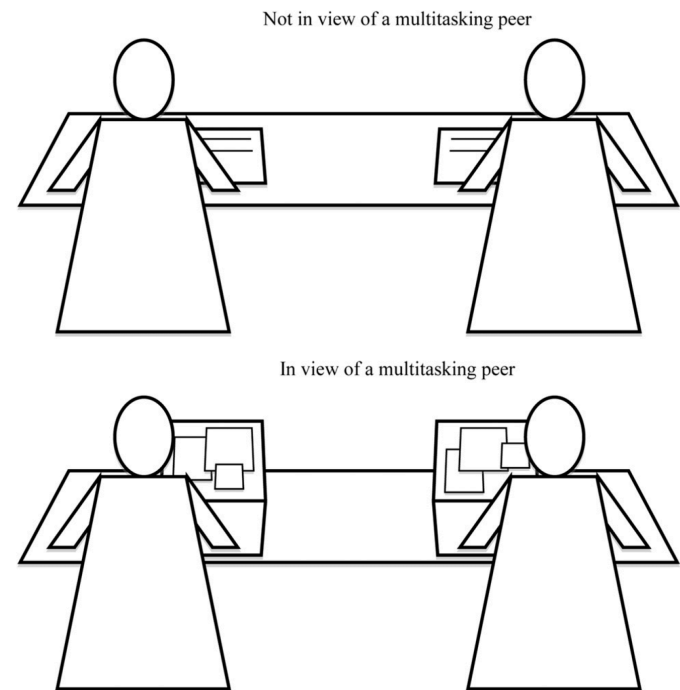
The notes taken by the multitaskers were also of poorer quality – e.g., missing the verbal information provided by the lecturer not included on the lecture slides

Laptop Use in the Classroom: Multitasking

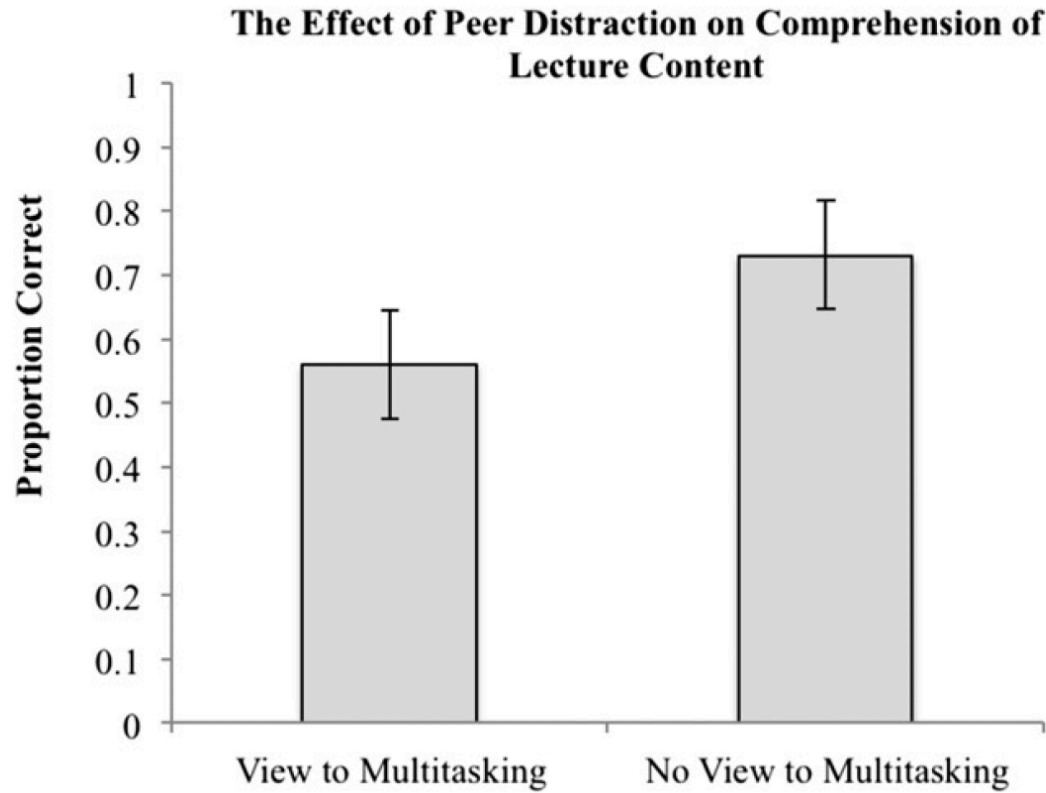
Sana, Weston & Cepeda, 2013

- Study 2: Examined effect of multitasking on *nearby peers* (rather than the multitaskers themselves)
- Participants themselves took paper-and-pencil notes (no multitasking)
- Participants in both conditions took notes of similar quality

How well do you think each group performed on the test?



(Fig. 2 from Sana, Weston & Cepeda, 2013)



(Fig. 3 from Sana, Weston & Cepeda, 2013)

Students in view of multitasking peers scored **17% lower on the test!**

Importantly, these students did NOT realize the effect that others' behavior was having on them – e.g., they believed their learning was “barely hindered” by their peers.

Laptop Use in the Classroom: Notetaking

Mueller & Oppenheimer, 2014 (updated 2018)

- What if you use your laptop *solely* for notetaking?
- Simulated classroom environment (watched 5 TED Talks), instructed to take notes “as they normally would in the classroom” either using a laptop or a notebook (longhand notes)
 - Note: laptops were disconnected from the Internet!
- After distractor tasks and a 30-min delay, participants took a test that included factual-recall and conceptual-application questions based on the talks

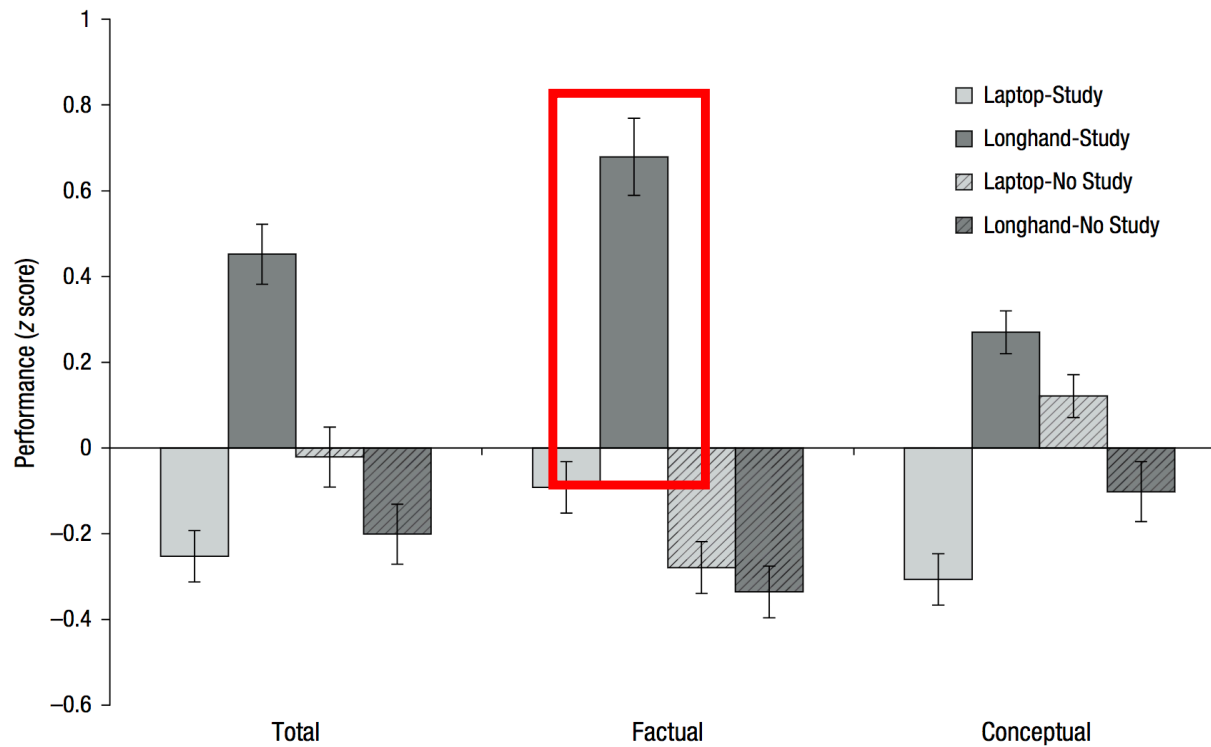
Laptop Use in the Classroom: Notetaking

Mueller & Oppenheimer, 2014 (updated 2018)

- **Study 1:** Laptop note-takers performed *worse* on conceptual-application questions; took longer notes, but more transcription-like (taking notes verbatim)
- **Study 2:** Specifically instructed to *not* take notes verbatim. Laptop note-takers still performed *worse*, and *still* took more verbatim notes than longhand note-takers.
- **Study 3:** Maybe laptop notes are better for *studying*? Nope - participants who took longhand notes AND were able to study from them performed better than anyone else.

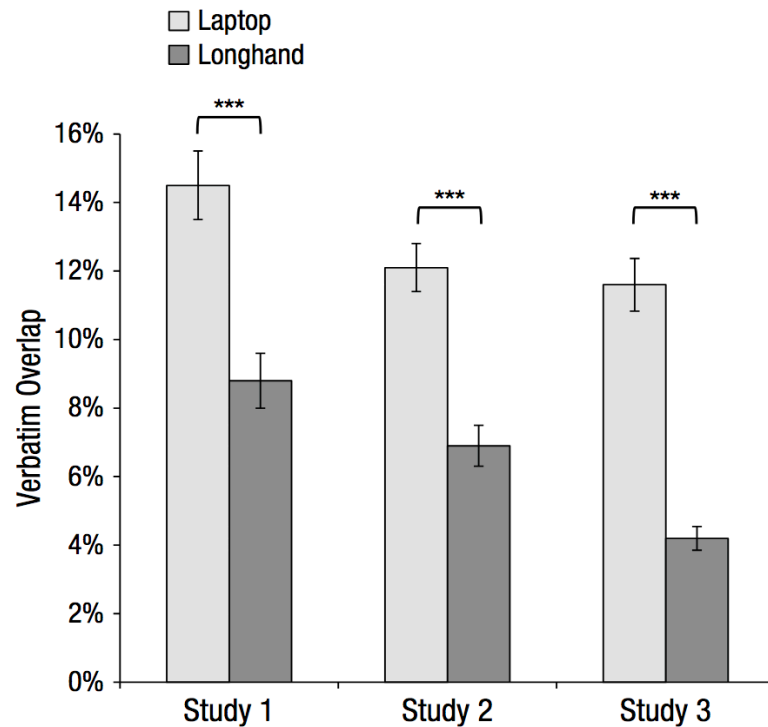
Laptop Use in the Classroom: Notetaking

Mueller & Oppenheimer, 2014 (updated 2018)



Laptop Use in the Classroom: Notetaking

Mueller & Oppenheimer, 2014 (updated 2018)



Because we are able to **type** much quicker than we write, it is much easier to take **verbatim (word for word)** notes with a laptop.

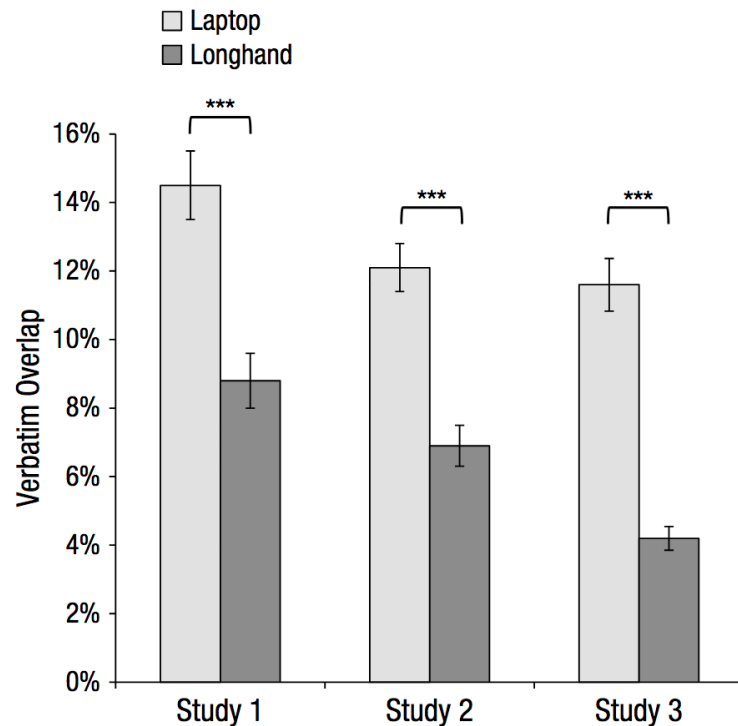
ME (Instructor)



YOU (student)

Laptop Use in the Classroom: Notetaking

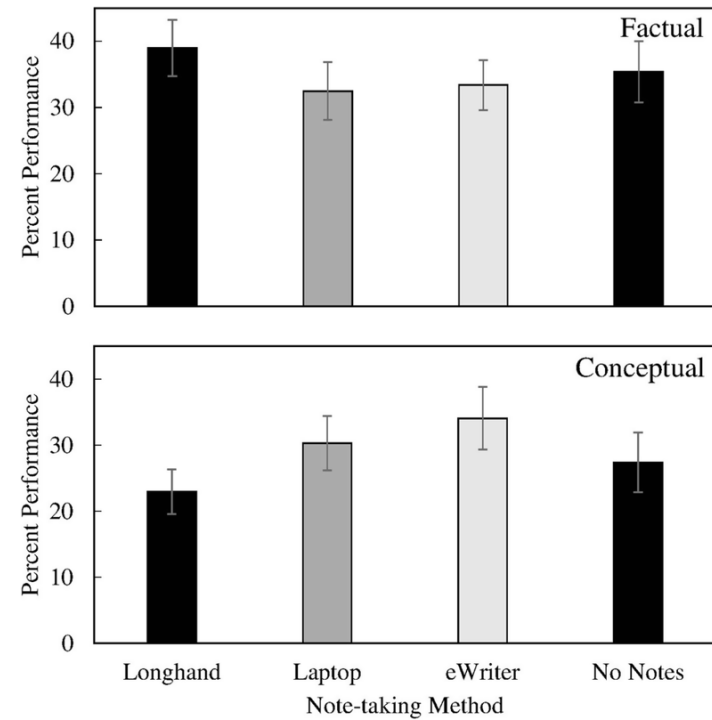
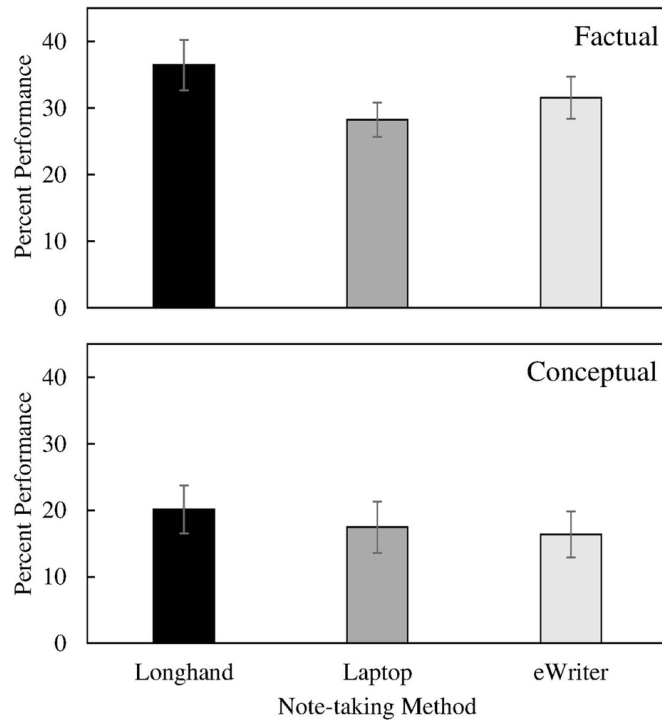
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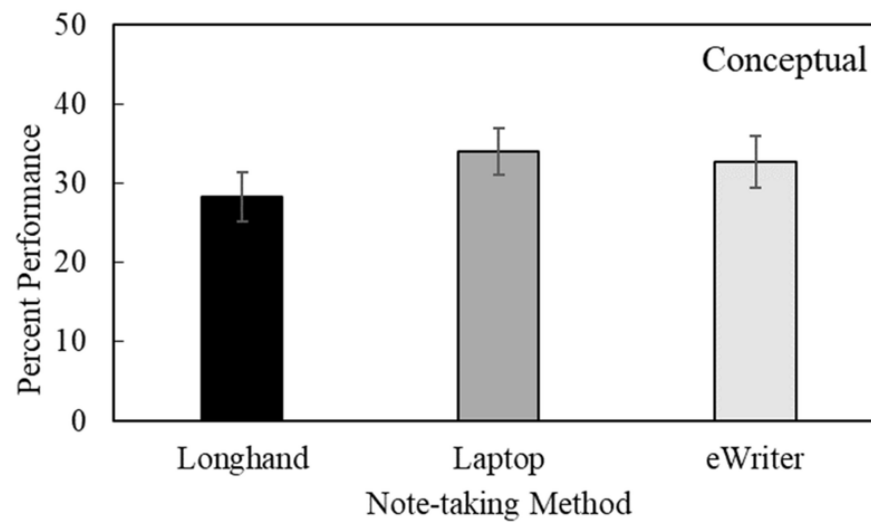
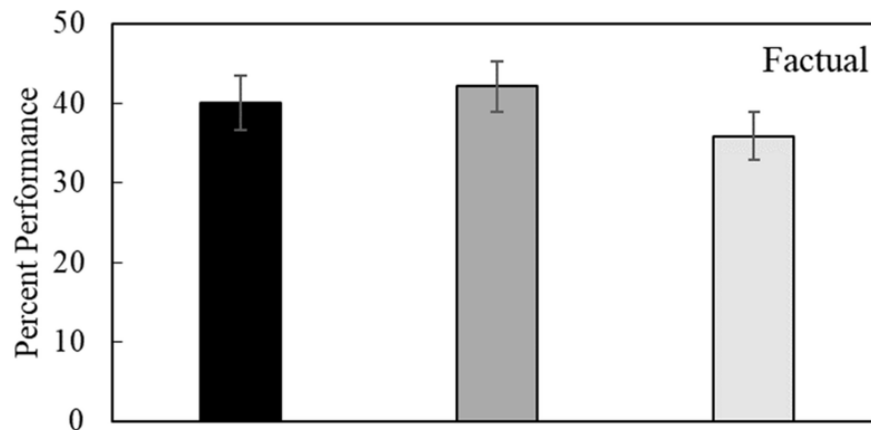


Because we are able to **type** much quicker than we write, it is much easier to take **verbatim (word for word)** notes with a laptop.

***Unfortunately,
transcription ≠ better learning!***

Replication & Extension: Morehead, Dunlosky, Rawson, 2019





- Delayed test; After studying from notes for 7 minutes
- No differences between groups

Laptop Use in the Classroom



- What are the key take-aways of this research?
 - Potential solutions?
- What are some practical rules/guidelines we should establish for laptop use in this classroom?

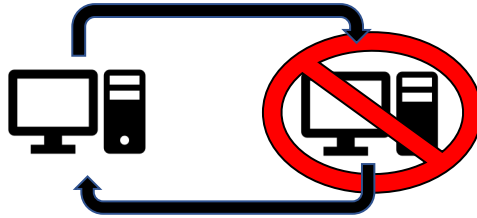
Laptops and tablets and cell phones – *oh my!*

- Of course, laptops are not the *only* potential source of distraction
 - Multitasking on cell phones and tablets is (not surprisingly) also detrimental to learning!
- And again, the research indicates that it's not only the USER of the device whose learning is impaired – but *everyone's* performance suffers when electronic devices are permitted in the classroom (e.g., Lee et al., 2017; Glass & Kang, 2018)



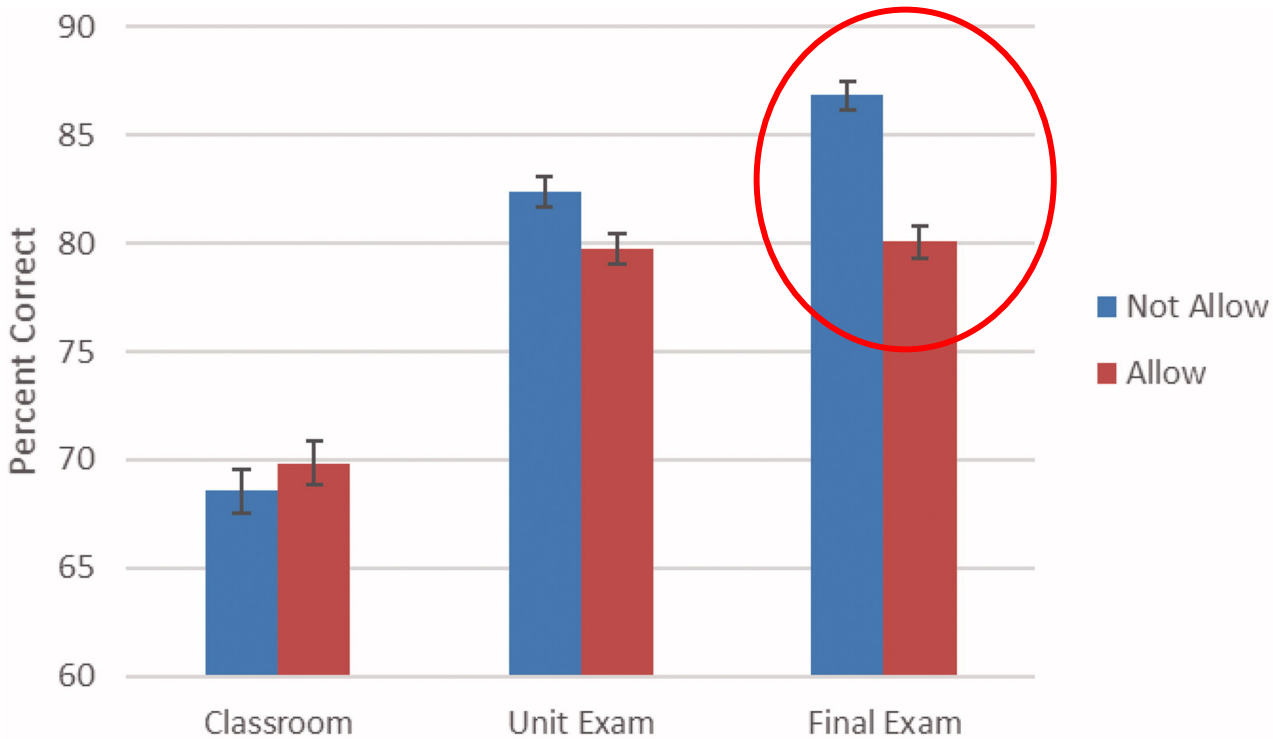
Glass & Kang, 2018

- Classroom experiment, using two identical back-to-back sections of an upper-year cognitive psychology course which met twice a week
 - In one section, electronic devices were banned on Tuesdays
 - In the other section, electronic devices were banned on Thursdays

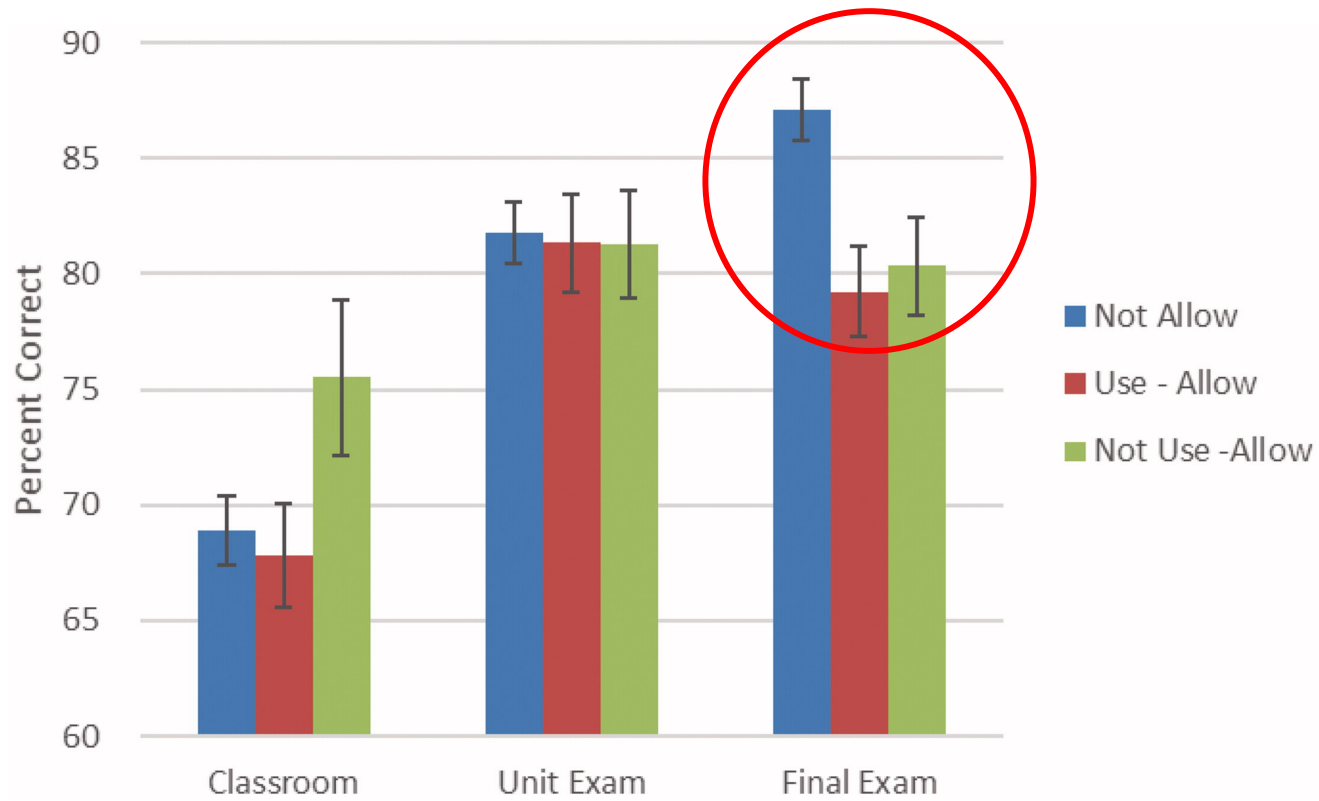


- Examined student performance on same-day in-class questions, unit exam (test) questions, and final exam questions

Glass & Kang, 2018: Results



Glass & Kang, 2018: Results



Glass & Kang, 2018: Final Thoughts

- Just because you can answer a question correctly in class, does not mean that your cellphone or laptop use is not impairing your learning!

"This is one of the occasional cases in human cognition where our intuitions mislead us, because even though they can divide their attention well enough to remember in the moment ... what happens is that a week later, they've pretty much forgotten what happened in class," Glass said. "What's the point of going to class in the first place if a week later you don't remember it?" (Inside Higher Ed, July 27 2018)

Glass & Kang, 2018: Final Thoughts

- The devices are not the enemy – after all, even on the “not allowed” days, these devices were used to answer the in-class questions!
- It is the misuse of these devices and subsequent distraction that is problematic, along with the fact that it can be very difficult for us to recognize the negative effects that the devices are having on us
 - If we don't recognize something as being a problem, it is very difficult to be motivated to find a solution!

Classroom Guidelines for Electronics Use

Electronic Devices *Outside* of the Classroom

- Of course, the classroom is not the *only* place where learning occurs!
 - Electronic devices can impair learning *outside* of the classroom as well



Electronic Devices *Outside* of the Classroom

- Research has shown that individuals who report having a *strong dependence* on their cellphones perform significantly better on cognitive tasks when their cellphone was *out of sight* (Ward et al., 2017)
 - Even if the phone was *turned off*, its mere presence impaired performance
 - Again, people appear to be *largely unaware* of this – participants do *not* report consciously thinking about or being distracted by their phones!



Products/apps you may wish to look into if you find yourself unable to control technological distractions (all have free options)

- <https://getcoldturkey.com/>
 - Can block yourself out of certain websites, the entire Internet, apps, etc., during specific time windows (e.g., when you have a class!)
- <http://selfcontrolapp.com/> (for Mac users)
- StayFocusd (Google Chrome extension)
 - Limits time spent on distracting websites
 - Freedom (available in the app store) – same idea, works on your iPhone, iPad
- <https://www.boomerangmail.com/>
 - If you use Gmail and email is a major distraction during class/studying