Multi-Tasking and Technology Use: A Help or a Hindrance?

by
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Disclosures

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Over past decade increased numbers of laptops in the lecture room
http://assets.amuniversal.com/bf377f60b93e013152d1005056a9545d

Increased use of social media

My own experiences

Could technology use be harmful?
Problem

- Past evidence to support that using laptops during lecture may result in lower academic performance

- Unsupervised use of laptops during lecture usually results in off-task attention due to multi-tasking

- Some nursing schools encourage use of laptops or even require them for lecture and other activities

- Past evidence done with other disciplines and not nursing (Fried, 2008; Hembrooke & Gay, 2003; Sana et al., 2013; Wood et al., 2012)
Problem Statement/Definitions

* Experimental study to determine the effects of off-task browsing on academic performance in nursing
* For the purposes of this research study,

**independent variables**—either single-tasking (on-task attention—pen-paper) or multi-tasking activities (off-task attention—use of laptop and a browsing assignment)

**dependent variables**—academic performance on pre-test/post-test represented by 10 item “quiz”
Determine the effects of multi-tasking on academic performance

What effect does multi-tasking have on students’ academic performance in the academic learning environment?

Null Hypothesis: There is no difference in academic performance between those who multi-task and those who single-task.
Assumptions

- Nursing students browse the Internet like other students and did so during an academic lecture.

- Students normally take notes either with their laptops or with pen and paper.

- Many instructors have no planned use for laptops during lecture and encourage students to use their laptops during classroom lecture.
Position statement NLN calls for innovation in teaching
http://www.nln.org/docs/default-source/about/nln-vision-series-%28position-statements%29/nlnvision_5.pdf?sfvrsn=4

Knowing whether laptop use is helpful or harmful during lecture is something that not only educators need to know but students as well

Some schools encourage laptop use during the class room setting without knowing potential effects
Literature Review

- Students are spending time during lecture in off-task browsing with as much as 40% of a lecture hour being spent on social media browsing (Fried, 2008; Kraushaar & Novak, 2010)

- Students have the perception that they can multi-task without penalty to other tasks, however, academic performance is negatively influenced (Fried, 2008; Hembroke & Gay, 2003; Wood et al., 2012; Sana et al., 2013)
* Browsing assignment resulted in lower academic performance (Wood et al., 2012)

* Even being in view of a laptop, yet not using one, was disruptive and resulted in lower academic performance (Sana et al., 2013)

* Survey of students: 78% reported being distracted by computers (Wurst, Smarkola, & Gaffney, 2008)—another survey concurred the same opinion by students (Fried, 2008)

* Even browsing on the subject of the lecture resulted in lower academic performance (Hembroke & Gay, 2003)
However, there were studies that showed that computers, if incorporated into the lecture, could be beneficial (Granberg & Witte, 2005; Trimmel & Bachmann, 2004)

Overall research done in other disciplines and not in nursing

Important to understand the impact of laptop use on academic performance in nursing students

If it is detrimental to performance, as other research suggests, we would want students to know that
Sweller’s Cognitive Load Theory

- Intrinsic: Goal = maximize
- Effective: Goal = manage
- Extraneous: Goal = decrease

Cognitive Load
Methods

* Pre-test/Post-test Design
  * Convenience sample of BSN students
  * Randomized assignment to either single-tasking (pen-paper representing on-task attention group) or multi-tasking (laptop with browsing assignment representing off-task attention group)
  * 10 item pre-test/post-test measurements used for several years in same research course
  * $\alpha=0.05$, $\beta=0.80$ and $r^2=0.50$

* Sample—according to power analysis, need 52 students (26 in each group), however, probably need to oversample to account for possible attrition; Cohen (1988) recommended $n=64$, whereas, final sample was 81. Overall, 106 recruited but nine excluded due to exposure to EBP module and sixteen excluded due to unable to match pre and post-tests

* Setting—collected data over two semesters and three sessions at one school where research course was taught in traditional classroom
Methods

- Controlling validity threats
  - Environmental effects—make sure area free of excessive noise, light adequate, comfortable temperature
  - Maturation effects—schedule about the same time of year at each session
  - Hawthorne effect/design fidelity—research assistant to monitor to make sure those in browsing group are completing browsing assignment
  - Instrumentation effects—make sure that research assistant and teacher are not answering questions before post-test given; use valid/reliable questions
Procedure

- Approved at 2 IRB’s
- Met with faculty and research assistant
- Purchased Mini IPADS
- Students given pre-test on first class day and two weeks later attended an EBP lecture where they signed informed consent, watched a 1 hour live EBP lecture, then took a post-test
- Students self-randomized into one of two conditions: single-tasking (pen/paper notes) or multi-tasking (laptop/browsing assignment) based on where they chose to sit
Ethical concerns

* If they completed informed consent, pre-test will be released to research assistant
* Pre-test/post-test will not count as a grade toward the course, however, questions may be repeated on a later exam. After post-test, students will be given answers to questions.
* An incentive to encourage participation is potential to be in a drawing for a IPAD mini at each session if they completed the study successfully
* They can drop study at any time, without penalty
* All data de-identified
* Data stored in locked office and will be destroyed in three years
### Demographic characteristics of the sample (n=81)

<table>
<thead>
<tr>
<th>Group</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age Group (years)</strong></td>
<td></td>
</tr>
<tr>
<td>18-24</td>
<td>51 (63.0)</td>
</tr>
<tr>
<td>25-34</td>
<td>21 (26.0)</td>
</tr>
<tr>
<td>35 and older</td>
<td>9 (11.0)</td>
</tr>
<tr>
<td><strong>Note-taking Preference</strong></td>
<td></td>
</tr>
<tr>
<td>Pen/Paper</td>
<td>71 (88.0)</td>
</tr>
<tr>
<td>Laptop</td>
<td>10 (12.0)</td>
</tr>
<tr>
<td><strong>Hours of Preparation</strong></td>
<td></td>
</tr>
<tr>
<td>Less than 1 hour</td>
<td>80 (99.0)</td>
</tr>
<tr>
<td>1 hour or more</td>
<td>1 (1.0)</td>
</tr>
</tbody>
</table>
## Results

<table>
<thead>
<tr>
<th>Post-Test Score</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.00</td>
<td>1</td>
<td>1.0</td>
</tr>
<tr>
<td>4.00</td>
<td>3</td>
<td>4.0</td>
</tr>
<tr>
<td>5.00</td>
<td>9</td>
<td>11.0</td>
</tr>
<tr>
<td>6.00</td>
<td>16</td>
<td>20.0</td>
</tr>
<tr>
<td>7.00</td>
<td>20</td>
<td>25.0</td>
</tr>
<tr>
<td>8.00</td>
<td>20</td>
<td>25.0</td>
</tr>
<tr>
<td>9.00</td>
<td>10</td>
<td>12.0</td>
</tr>
<tr>
<td>10.00</td>
<td>2</td>
<td>2.0</td>
</tr>
</tbody>
</table>

| Total           | 81        | 100.0   |

Mean = 6.47
Pre-test and post-test score differences, with equal variances assumed, in Academic Performance in students who were single-tasking (pen and paper group) and students who were multi-tasking (laptop browsing group).

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>M(SD)</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pre-test</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single-tasking</td>
<td>40</td>
<td>6.51(1.86)</td>
<td>1.155</td>
<td>.252</td>
</tr>
<tr>
<td>Multi-tasking</td>
<td>41</td>
<td>6.05(1.74)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Post-test</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single-tasking</td>
<td>40</td>
<td>7.43(1.52)</td>
<td>-2.75</td>
<td>.007</td>
</tr>
<tr>
<td>Multi-tasking</td>
<td>41</td>
<td>6.56(1.31)</td>
<td></td>
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</tbody>
</table>

Note: n=number in each group; M=Mean; SD=Standard Deviation. Outliers were included in this sample (N=81).
Discussion

* For overall tasking type, no significant difference in pre-test scores, however, significant positive difference in post-test scores for those who single-tasked

* Those who multi-task do worse on overall quiz grade than those who single-task (use only pen/paper to take notes during class) versus those who single-task do better on overall quiz grade than those who multi-task

* Multi-tasking (taking notes during a lecture with a browsing assignment) significantly negatively influences academic performance (quiz grade)
null hypothesis:
There was no difference in academic performance between those who have off-task versus on-task attention during a lecture. Rejected

experimental hypothesis:
There was a difference in academic performance between those who have off-task versus on-task attention during a lecture. Accepted
Limitations: Small study, one school in one place at one time, potential Type 1 error, definition of Academic Performance is the result of a quiz, only ten-item quiz

However, it was randomized assignment with more than needed in sample as recommended by Cohen (1988), Cohen recommended n=64, whereas, final sample was n=81
multi-tasking is another form of extraneous load (like excessive noise or uncomfortable temperature in the classroom) which causes off-task attention and contributes to cognitive load in CLT.

- can be controlled by the instructor so that learning takes place

- nursing students are comparable to other students--multi-tasking impedes academic performance significantly compared to single-tasking
During lecture, there are times the instructor should ask students put away laptop and focus on the lecture

If using laptop during lecture period, instructor should quit lecturing, give time for in-class laptop assignment and let students explore during this time

Students should be made aware of potential difference that has resulted in research studies on this subject so they can make an informed decision about when they should use laptops and when they should not
First, decide what your policy is and enforce it. My suggestion is no technology use during lecture but stop every 10-15 minutes for technology use.

During technology use, do not lecture. Allow 10-15 minutes for application of previous material. Can count the work they do during this time as a quiz grade.

If not going to limit computer use, then reserve first few rows for pen/paper only, all others using devices sit on back rows.
What’s an Educator to do?

* Be creative in technology use.
  “If you can’t explain it simply, you don’t understand it well enough.” Albert Einstein

* For example, use twitter as a way to make students concisely define information.

* Use pinterest as a way to gather information about a subject to create a repository for future use.
Showme.com is a service that allows you or your students to post a video on what they learn. If you flip the classroom, you can ask students to get into groups and develop a “showme video”.

Create a creative ppt with Prezi:
https://prezi.com/utnstcub_qft/?utm_campaign=share&utm_medium=copy&rc=exoshare

Or, they can search youtube videos or showme videos that are helpful for the topic on hand. In addition, you can ask the students to evaluate the videos that are found. Example:
https://libguides.colostate.edu/howtodo/evaluatemovie
What’s an Educator to do?

* Have students develop quiz questions/topics.
  Example: [https://quizlet.com/46414927/cne-prep-4-flash-cards/](https://quizlet.com/46414927/cne-prep-4-flash-cards/) or [https://www.studyblue.com/](https://www.studyblue.com/)

* Have students develop an infographic on the subject:
  Examples:
Future research

* Educational research: Effects of being in view of laptop but not being on laptop; using other types of technology (IPADS, cell phones); longer term definitions of academic performance (i.e., exam or course grades); innovative teaching; students’ perceptions

* Clinical research: nurse/patient studies such as med administration (NIZ; headphone use), discharge planning; nurses who carry phones when working in healthcare


* Replication: Larger samples, other areas of the country, other types of nursing programs
Questions?

* More research references here:
  http://www.quia.com/pages/kbuckner/page15
References


