
AC 2011-537: R U ALL THERE? TEXTING, SURFING, AND E-TASKING IN THE CLASSROOM AND ITS EFFECTS ON LEARNING

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R U All There?

Texting, Surfing, and E-Tasking in the Classroom and its Effects on Learning

We often talk about 'paying attention'. Children never seem to do it and we occasionally get it wrong and miss something important. These sort of everyday experiences suggest that attention can be directed to objects or activities, and things to which we are not paying attention are often not perceived –or not recalled.

*~ Sanders & McCormick, Human
Factors in Engineering & Design*

Abstract

This paper presents the results of a study of first-year engineering students and their perceived ability to multitask while in class. Students are now exposed to numerous sources of electronic distraction such as text messages, instant messaging, email, and web browsing which are now all conveniently available on their smart phones or in other portable electronic formats. The results of this study between a control group (students without any e-tasking opportunities) and a cohort group with freedom to e-task during class showed statistically significantly lower content retention scores amongst the e-taskers. In addition, there was a statistically significantly lower self-reported perception of their knowledge retention as compared with the control group. Recommendations on how to handle e-taskers and strategies to deal with the Net generation of students we now see in our classrooms are presented and reviewed.

Introduction

We –and our students– have all learned to multitask in our busy lives. People conduct multiple activities simultaneously, from talking on the phone while driving to checking text messages in the middle of conversations. Given the pace of life these days and the availability of devices to keep us connected, our culture has nearly come to expect that 'mult-e-tasking' (e-tasking) will keep us from missing out on all life has to offer. What happens when this perspective enters the classroom? What are the effects on learning and the quality of the classroom environment when students in class are in the habit of dividing their attention believing that there are no adverse effects? There is mounting research evidence to support the notion that while our society manages to multitask adequately, adding e-tasking to important activities such as driving and learning can have detrimental effects not only on the tasker, but also on those in their environment.^{10,27,30} Furthermore, there are social implications for failing to be fully present when more attention is given to electronic media than to the individuals in our own presence.

With this growing concern, faculty at Northeastern University reviewed the literature and conducted further empirical research to explore and evaluate the in-class learning effects of e-tasking distracters. A first-year engineering programming class was divided into Control and E-Tasking groups. In the Control half of the class, students were explicitly and clearly instructed to switch off all cell phones, electronic mobile devices, and computers, while in the E-Tasking group students were allowed to have all electronic devices available and no verbal instructions were given to turn them off. Both groups were given identical class lectures and a content retention quiz at the end of the presentation and were questioned as well on their perceived retention of the material from class. The purpose of this paper is to report the outcomes and impressions of this study. In addition, a review of classroom management strategies will be

presented which may be used to generate awareness of the consequences of e-tasking in the classroom and beyond.

Attention and Learning

Learning and functioning effectively each require a baseline of attention to the task at hand. There are many types of attention that can create demands on our cognitive capacity: *selective*, *divided*, *sustained*, and *focused* attention, each with different contributors and outcomes.²⁵ These will be discussed in relation to general tasks as well as classroom learning in order to provide a general understanding of how our cognitive bandwidth manages attentional demands.

Selective attention involves monitoring multiple sources of input to detect relevant or critical information. This often involves scanning and prioritizing according to the sources that provide the most likely ‘signal’. A worker does this to check readings on several displays, looking for one that may be out of range. A professor does this at times to determine if any students may have questions in the classroom, or to see if there are any more exams to collect, for example. This also comes into play when an instructor is scanning for feedback and detects shifts in body language when a student is doing something other than participating appropriately. This task of paying attention to the classroom tone has a rhythm that is affected by activities that are out of synch with expectations –and these serve as distracters to the educator whose selective attention is pulled away from teaching and monitoring toward an ancillary activity that affects more than one student.

To take a different view on selective attention, in addition to the false-positive effects of e-taskers drawing attention from the instructor, there is the scenario in which the scanning exercise leaves the instructor without sufficient feedback sources. This is because the educator is not only competing with the mobile electronic devices for attention, but also is deprived of eye contact and other forms of feedback from students because they are otherwise occupied and unavailable.

Divided attention is different from selective attention in that the individual is required to attend to multiple tasks with different objectives. When human beings attempt more than one task simultaneously, at least one of the tasks –if not both– experiences degradation in performance. At times this is of little consequence such as when talking to someone while changing television stations. Other times it can be devastating; we have seen texting and driving laws result from tragic collisions due to lapses in attention from the road. When the outcome of functioning with divided attention is not problematic or the effects appear negligible, it is easy to become convinced that we can multitask successfully –or at least without significant consequences. The effects of divided attention are most applicable to our research as our e-tasking students appear to operate their electronics with the impression that nothing –or nothing important– is lost when their attention is momentarily shifted from the world of the classroom to the electronic realm. It also can affect the educator when he or she needs to be engaged in a teaching task, but is then attending to the simultaneous distractions from the classroom. Divided attention scenarios should be avoided as they can compromise teaching quality in certain cases.

Sustained attention requires a person to maintain a level of vigilance over a long period of time, often with very little stimuli. The vigilant condition is adopted in order to detect an anomaly or a momentary deviation that is of significance. The requirement of sustained attention poses a

challenge to the human participant to maintain a high enough level of awareness to perceive a rare but critical event. We hope this type of attention is less relevant to education!

Focused attention requires the participant to maintain attention and not be distracted by other stimuli or inputs. This is particularly challenging when the inputs are nearby. The closer in proximity a competing stimulus is located, the more difficult it is to prevent focused attention from becoming divided. As such it becomes nearly impossible to ignore a source of information when it is in close proximity.²⁵ An understanding of this is relevant to our work as we theorize that individuals e-tasking nearby also can distract a neighboring student from learning even if the distracting task is of no importance to the learner and even if the activity is subtle.

In an interview conducted by Jon Hamilton (2011), MIT Professor of Neuroscience Earl Miller states "People can't multitask very well, and when people say they can, they're deluding themselves," and "the brain is very good at deluding itself." What we perceive as e-tasking is really our ability to shift focus from one task to another quickly. "Switching from task to task, you think you're actually paying attention to everything around you at the same time. But you're actually not... you're not paying attention to one or two other things simultaneously, but switching between them very rapidly." One of the main reasons for this switching is that similar tasks will compete to use the same part of the brain.

In an article entitled *Divided Attention: In an Age of Classroom Multitasking, Scholars Probe the Nature of Learning and Memory*, Clifford Nass, a professor of psychology at Stanford University, notes, "Heavy multitaskers are often extremely confident in their abilities, but there's evidence that those people are actually worse at multitasking than most people."¹⁰

A study with students at Sterling College uncovered a slightly different attitude in terms of learning and processing: Part of their e-tasking survey asked students how often they responded to cell messages in different contexts and what effects they thought texting had on their learning.³⁰ "What most surprised me was the finding that students expect to lose information when they text-yet they do it anyway," reported Dr. Arnold Froese, Sterling College Psychology Chair. He went on to say, "The survey did reveal, however, that low frequency texters expect greater decrements from texting than high frequency texters do."

It has been well established that human beings cannot attend to multiple things simultaneously, unless one of them becomes 'automatic'. Since learning involves accessing the part of our cerebral cortex in a way that is not automated, learning is lost once attention becomes divided or unfocused.¹⁷ In the literature, *College Learning: Ways and Whys. Attention*, F.A. Logan discusses the 'Principle of Active Participation' which maintains that you will only learn from verbal material if you notice it, think about it, and actively attend to it. Furthermore, short-term memory, long-term memory, and as a consequence learning and retrieval, are all affected by interruptions in the cognitive encoding, storage, and retrieval process.² E-tasking serves as a decided interruption to these processes and undoubtedly thwarts the benefits of the Principle of Active Participation.

Some recent research has been done to investigate the effects of using mobile electronic devices during class.³⁰ Results have shown clearly that the distraction factor is not only high, but that it

is decidedly higher (is more apparent and dramatic), broader (affects more than the direct participants), and even deeper (has a more pronounced subconscious effect) than we initially thought. This paper further investigates these effects on our first-year students and their learning.

Current Culture of Mult-e-Taskers and Cultural Shifts

There seems to be some mixing of signals when it comes to how we should respond to e-tasking. Early generations might find it uncouth if someone in a meeting begins to check email or respond to a text message. Pearson (2010) surveyed around 9000 people and found nearly two-thirds perform this habit *and* recognize it as a problem. Asking the question "So why do we perpetuate it?" she found the rationalization heard most was: It's a way to multitask and increase efficiency. But we now realize that this makes us less efficient as found by many neuroscientists and most will agree it is rude; we justify it anyway as being productive, but in actuality, it is a rationalization.

In an interview conducted on Frontline PBS, Professor Clifford Nass of Stanford University discusses the societal forces encouraging multitasking especially in the workforce.¹⁹ He states that it is often the case that workers are being told "You must answer e-mail within 15 minutes." Well, that means you're stopping what you're doing. Or, "You must keep your chat windows open." So, if anything, cultural forces and the expectation that people will respond instantly to chat and talk and do all these things once means, frankly, that all the pressure is going against a movement to stop multitasking. In addition, he discusses the fact that many companies are calling him and saying, "How can we stop this? Our workforce is being driven crazy," which again offers an opposing view.

One group that has reported guilt when multitasking in general has been mothers managing a household with young children. Multitasking helps mothers get things done but it comes with an emotional cost that appears to be gender-related. Amongst mothers, multitasking is associated with more negative affects (e.g., higher levels of being frustrated, irritated, and stressed).²⁶

Outside of the office or the home, one area that has received much attention lately is that of multitasking while driving. The National Highway Traffic Safety Administration (NTSA) reports distracted drivers account for almost 80 percent of all crashes in the U.S. In a 2007 survey conducted by Nationwide Insurance, even those who perceive themselves as safe drivers admit to doing outlandish things behind the wheel, including changing clothes, balancing a checkbook and shaving.¹¹

According to the NTSA survey of 1,200 Americans, 83 percent of those polled believe they are safe drivers and 59 percent don't consider themselves distracted drivers. However, 73 percent say they talk on cell phones and 38 percent admit they have driven a certain distance without any recollection of doing so. Those in the Generation Y (dates born 1980 – 1994) age group are the guiltiest of driving while distracted, with 35 percent admitting to always multitasking in the car and 37 percent of this age group admitted to texting or IM-ing while driving. Compared to the older age groups, the survey reported 30 percent of Generation X (dates born 1965 – 1979) and 21 percent of Baby Boomers (dates born 1946 – 1964) confess to multitasking with 17 percent of Gen X and 2 percent of Baby Boomers admitting to texting or IM-ing while driving.

With such a proliferation of data to suggest that driving and e-tasking is not advisable, many states have instituted new laws declaring it illegal. A survey of the Governors' Highway Safety Organization found eight states (CA, CT, DE, MD, NJ, NY, OR, and WA), DC and the Virgin Islands prohibit all drivers from using handheld cell phones while driving.⁶ No state bans all cell phone use (handheld and hands-free) for all drivers, but many prohibit all cell phone use by certain drivers:

- **Novice Drivers:** 28 states and DC ban all cell phone use by novice drivers.
- **School Bus Drivers:** Bus drivers in 18 states and DC may not use a cell phone when passengers are present.

Currently there are 30 states, plus DC and Guam that ban text messaging for all drivers. Eleven of these laws were enacted in 2010.

There are many other examples of a culture shift to mitigate the use of cell or smart phones in public places. We see requests to turn off phones in restaurants, libraries, theatres, on airplanes, in doctor's offices, at post offices, and in other private settings. We are seeing them banned on commuter rail trains with the introduction of so called "quiet cars" as reported by the Massachusetts Bay Transit Authority.²⁴ These cars are being modeled after a recent successful European program. Cell phones are even banned at polling stations in order to protect the privacy of voters since most phones have cameras. Finally, they are being turned off in the classroom. In addition to being a distraction to educators and students who are sitting next to those e-tasking, they offer potential avenues of unauthorized communication and new methods of cheating.

Engagement: Can we have your attention, please?

In order to prevent students from being distracted by the multitudes of electronic devices, it has been stated that the classroom setting and the educator need to provide the most engaging experience and the problem will be eliminated.⁴ The instructors' at Northeastern University experience is that this is true – in part. Teaching has been transformed at Northeastern University as a result of research, attendance at workshops and conferences resulting in adopting new practices that include active and engaging learning methods.^{7,8,15,33} Some of these are described by Marshall and Marshall in "Crucial Teaching Strategies for Engineering Educators".¹⁸ The focus is on learning-centered teaching, with Problem Based Learning, Group Learning and proper teaching preparation. The teaching techniques include the "Seven Good Practices" for Teachers, presented in different ways over the last decade, along with teaching with hospitality, listening, and assessment of the students' learning. These strategies with a 'learning not teaching' focus have permeated teaching philosophy and practice. In research that included student feedback, students looked for applications; help with visualization, interactive and dynamic classes, passionate and enthusiastic teachers that connect to the students.⁴ These strategies have been embraced and conveyed to all instructors at Northeastern University and faculty have been hired on the basis of possessing these characteristics and philosophies, with their other qualifications.

Other related work that focuses on engaging students discusses many activities and teaching strategies that were previously integrated into first-year courses.^{9,29,32} The courses at Northeastern University have incorporated active learning techniques, with many hands-on aspects. The two courses in the first-year program have design-to-build team projects, multi-media presentations and activities, case studies, design problem sets, along with embedded applications in programming, computer classrooms with classroom assessment techniques, designed to actively engage the students, focused on their learning and learning styles. Yet even with continuous improvement and a strong focus on student learning and engagement, the problem of students e-tasking persists in creating distractions in the classroom, even with efforts to dissuade them from doing so.

Current Classroom Strategies for Reducing E-tasking Distractions

In an attempt to reduce the e-tasking in class, some new strategies were adopted at Northeastern University. In a recent semester, the first class of the semester contained a discussion of the non-tolerance of phone use during class. This was also written on the syllabus. It was reinforced frequently without disparaging any one student. It was clear to the students that cell phones were not appreciated, to the point where in some cases, one student would tell another to put a phone away. Yet, there continued to be observed texting, especially in the back of the room. There was a definite and noticeable reduction in cell phone use and the atmosphere of the class was focused on the material and activity at hand for the most part. This created a more positive attitude in the faculty and the students seemed fairly comfortable with the guidelines. Also in the class, cell phones were collected at each exam; this became standard practice with no apparent complaints or issues.

With laptop use also being a distraction, a number of times the instructor would insist on all laptops being put away when it was a group activity that did not require note taking or computers. But at other times, when students may be using laptops for note taking, it often seems that they are doing other tasks, not just taking notes. On presentation days, laptops were a definite problem and distraction. Since students had their laptops to give their own presentation, they were often tweaking and polishing presentations while other groups were presenting. New strategies are always needed!

Motivation for Research

There were several objectives for conducting this research despite the strength of the cognitive and educational literature and observational evidence. First, we anticipated obtaining similar results as past researchers and would likely confirm our belief that e-tasking has a significant effect on students, on classmates nearby and in view, and on the professor or presenter. We also wanted the students to experience the distracted environment for themselves and be able to discuss it freely after the fact since most of the e-tasking was externally initiated. This would avoid singling out individuals in the absence of a distracting catalyst. Also, the presenter was able to experience and convey the distinction between a distraction-free class and one that was full of e-tasking events. Finally, as educators, we had the opportunity to create policies that were based on empirical research and first-hand data if our hypotheses were upheld. We welcomed the prospect of partnering with the student participants to help us generate policies and find a way to introduce them in a way that they were most likely to be upheld.

Methodology

The experimental design was constructed by first dividing a single class into two sections. This controlled the instructor variable, class experiences, attitudes, and time of day along with any course content. The course instructor had been tracking his students, observing which students were frequent cell phone users during class and which students were friends and work partners within the class. The instructor then divided the class in a way such that two friends or work partners were in different groups, enabling us to have one group text the other with some knowledge that they had phone numbers of members of the other group. Group 1 was in class while Group 2 had a breakfast meeting with the instructor to discuss a class project. Group 2 was told the class was split since no food is allowed in the computer classroom and the only conference room available could only accommodate half the class. Back in the classroom, the presenter (also a professor who teaches the course) gave a 15-minute presentation that was relevant to the course. For Group 1, the presenter was adamant that phones were not to be used, that they were to be put away and turned off, there was a clear instruction to refrain from any cell phone use for this short time. At the end, a short content quiz was administered, with the description that it was to help see what impacted them, and what they remembered.

In part two, Group 1 went to the breakfast meeting with the instructor and Group 2 came to class for the presentation. The groups were unable to contact one another during the classroom shift. The presentation was identical, except that no instruction was given on cell phones, and the instructor referred to the phones as part of the talk to ensure that they were out and available. Group 1 (at breakfast) was instructed to now try to distract their partner member of Group 2 with text messages. Message topics were chosen by the students. If they did not get responses, they tried again. The group in class was also free to engage in other e-tasking activities, such as surfing the web and checking e-mail –and they did. At the end of the presentation, Group 2 was given the same content quiz. Then the two groups met for a discussion of the events and were told what had transpired. They were debriefed as to their role and why, and also answered a questionnaire about the effect on their attention during this experiment and in general, the effect of e-tasking on their attention in the classroom.

In addition, all student participants completed a questionnaire in which they quantitatively reported the amount and types of e-tasking they conducted while in class during the presentation and provided their opinions about using electronic devices in the classroom. They also responded as to their own general e-tasking habits and their impressions of how distracting it may be to themselves, other students, speakers, and professors in the classroom.

Results and Discussion

Demographics. The participants were first-year students or transfer students enrolled in a Problem Solving and Computation class. Of the twenty-one subjects who participated, 2/3 were male and 1/3 were female, with a mean age of 19.76 ± 1.4 years across the group.

Gender. Between genders, two significant differences were found in relation to their phone use. The students were asked, “In general, do you bring a cell phone to class/campus?”, with the Likert response options ranging from “Practically never” (1) to “Just about always (5). As seen in Figure 1, the female students were significantly more likely to have a phone with them as compared to the male students with $p < 0.04$. On the other hand, when these same individuals

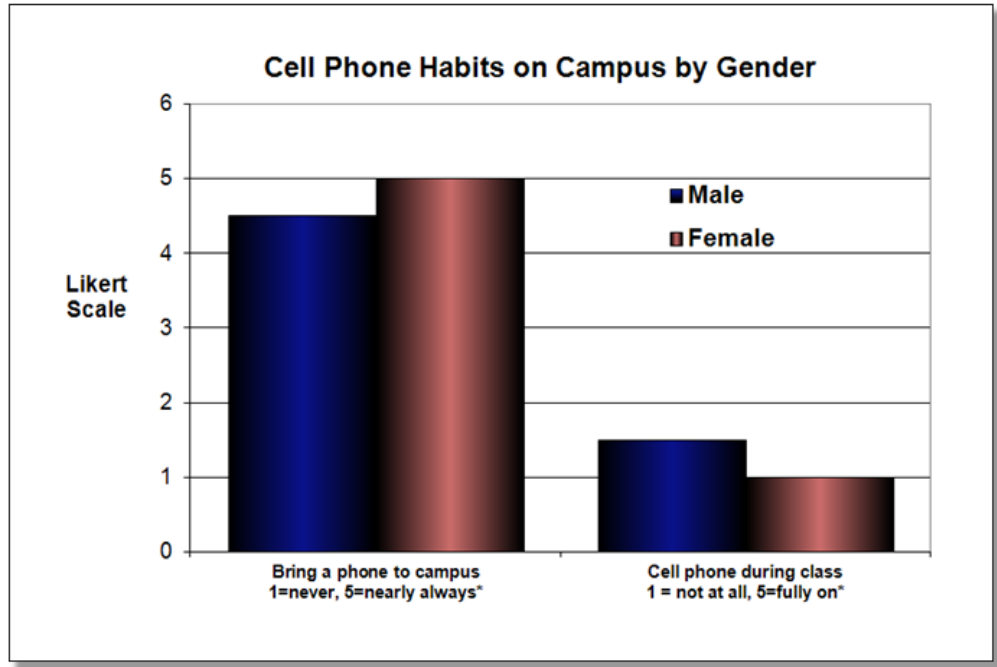


Figure 1. Reported gender differences in cell phone habits on campus.
*Reveals statistically significant results.

were asked about the “status of their phone during class in general”, and the potential responses ranged ordinarily from having it fully on to having it switched off, the females were more likely to have their phones switched *off* during class –or most of the class time, $p < 0.05$. This difference is also seen in Figure 1.

Age. The ages in the group of participants spanned from 18.2 to 24.7 years of age. Over a series of stratification analyses, no correlation or distinctions were found across this 7+ year span of students on any of the measures on the factor of age.

Usage by Group. Students were asked to provide an honest profile of their e-tasking activity during the class presentation with the following question:

Did you use your cell phone/device during today’s class/presentation? Check all that apply and fill in blanks:

Yes, I received text messages. []	Yes, and I replied to messages. []	Yes, I initiated texts (not a direct reply). []	Yes, I checked email and/or browsed online. []	I had no phone activity during class time today. []
How many? _____	How many? _____	How many? _____	Email ___ Surfing ___	

The responses shown below in Figure 2 are consistent with the general impressions by the observers that were in the classroom. Notable is that in both groups almost as many students initiated activity, checked email or browsed the internet. The amount of replies and received was greater in the E-Tasking group given the Control groups' charge to contact them. These results reveal a more extensive e-tasking profile in terms of frequency and method when it is permitted and tolerated in class and this is not surprising, given that many contacts were deliberately initiated from outside the classroom.

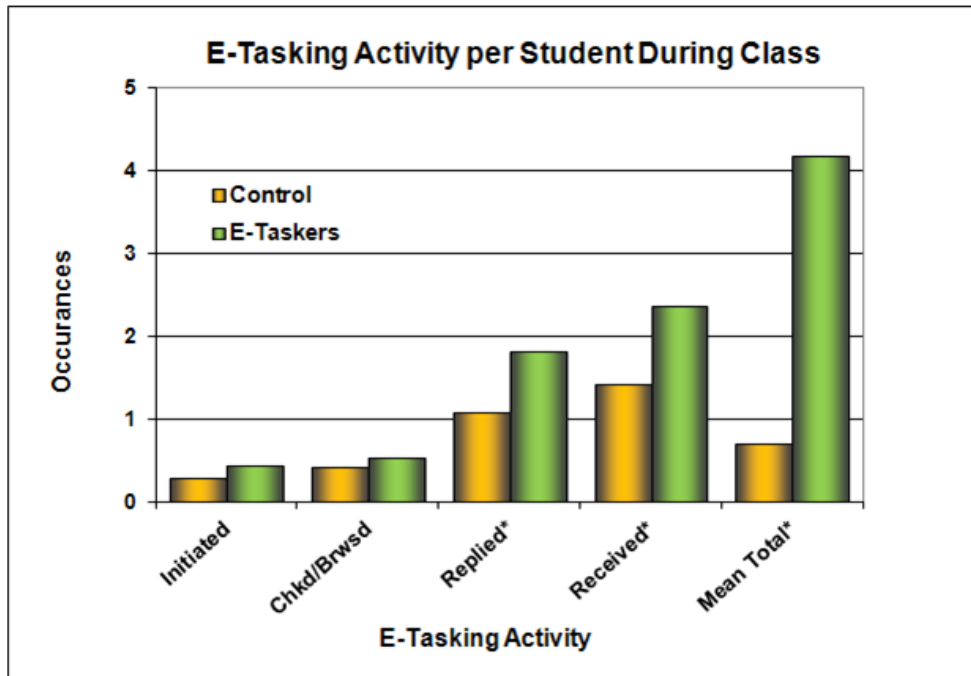


Figure 2. Average level of activity per student during experimental period. Activity primarily relates to texting, but also includes email checking and internet browsing. *Reveals statistically significant results.

Amount Retained/Learned. The actual content quiz scores were recorded and analyzed. In addition, the first question in relation to the class activities asked the students how much of the speaker's content they thought they retained. The scale is seen in Question 1 in the Appendix, with 1='practically none' and 7='nearly all of it'. As shown in Figure 3, analysis confirmed a differential between the Control and E-Tasking groups with two compelling results: First, statistically significantly lower content retention scores were seen with the E-Tasking participants as compared to the Control cohorts, $p < .03$, and second, E-Tasking students' self-reported perceptions of their own knowledge retention was also statistically lower than their more attentive cohorts, $p < .01$.

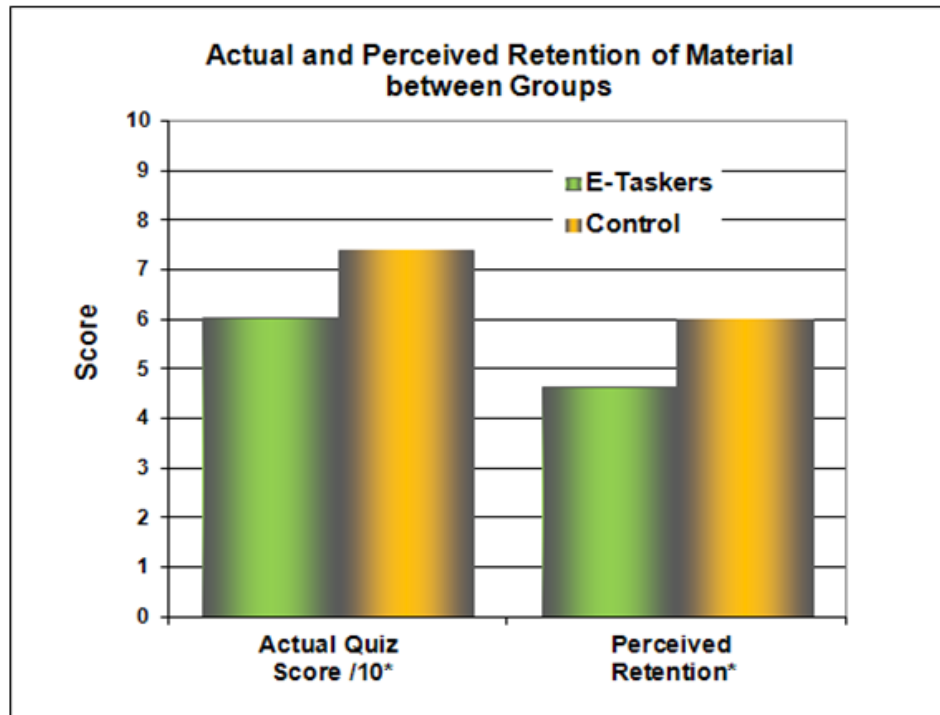


Figure 3. Knowledge-retention profiles: actual and perceived. *Reveals statistically significant results.

E-tasking Habits in General. Students were also asked to report the level of usage beyond that day’s activities: “In general, do you e-task (text/email/check messages and/or surf the web) during class/presentations”? The profile is seen below in Figure 4. Over 50% of the students report at least one episode of e-tasking per class with only slightly less than 10% making an effort not to. Over the course of a few classes, 90% of students will have e-tasked at least once.

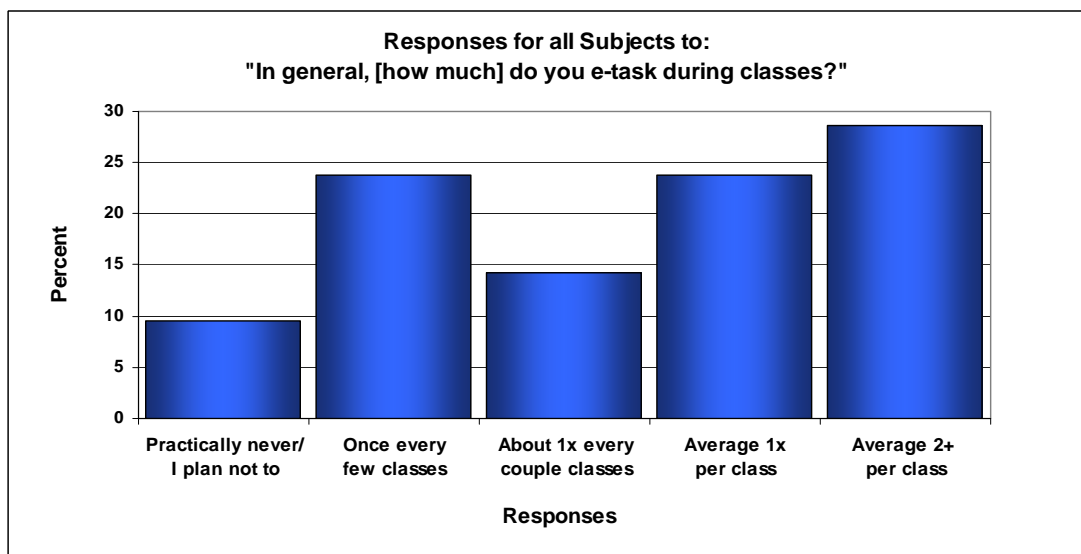


Figure 4. Reported e-tasking habits of students during class.

For this cohort, e-tasking observations were made and recorded by the course instructor over a two-week period (eight 100 minute classes) prior to the study. It was observed that 35% of the class participated in e-tasking while the instructor was; lecturing, responding to a question asked by another student, reviewing a homework assignment problem or reviewing a program example. Incidentally, two students e-tasked every day with three others e-tasking on at least four or more of the days and they all finished the course with above average grades. It seems that this cohort will “tune out” when the class conversation no longer becomes relevant to them such as discussing a problem with the homework that they might have already solved or discussing material in class that they already understand.

Distraction Created from Nearby E-tasking. When asked “Have you ever been distracted from focusing or learning by those near you who use their mobile devices during class?” nearly 70% answered ‘Sometimes’, ‘Quite often’ or ‘Just about all the time’ as shown in Figure 5. However, less than 10% find themselves chronically distracted by nearby e-tasking. Interestingly enough we see that 90% engage in e-tasking from Figure 4 with 70% reported that it is distracting. Our students understand the consequences but do it anyway.

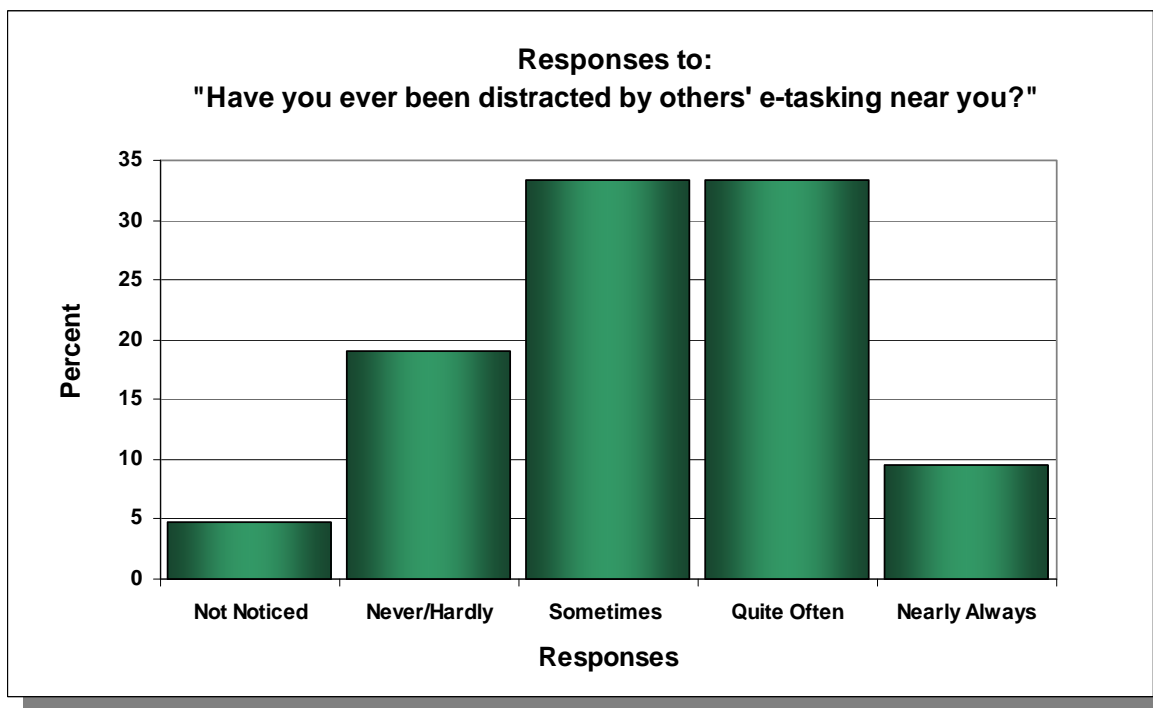


Figure 5. Student responses to being distracted by nearby e-tasking.

Distractions to Self as Presenter. When the following open-ended question set was posed, “Have you ever been presenting while listeners were e-tasking?” and “Please comment on this experience”, nearly 48% answered the equivalent of ‘Yes’, over 52% said ‘No’, and a couple of those conceded that perhaps they were unaware of it had it been going on. The comments from those who did have the experience of having to compete with mobile devices for the attention of an audience had some of the following descriptors in relation to this experience, which are representative of the majority of the feedback:

“It can be annoying.” ... “It bothers me.” ... “It’s rude.”
“People are pretending to listen even though their eyes move up and down to the phone.”
“It makes me feel like no one’s listening and not respectful enough to hear what I have to say.”

There were a couple of other viewpoints on this, however. Ambivalence was reflected in the following two isolated statements:

“It doesn’t really bother me, though.”
“I generally don’t care, but notice it’s rude.”

Only one dissenter replied relative to his own presentation, *“I don’t blame them, the presentation was boring.”*

Distractions to Professor/Instructor. Next the students responded to questions about the professor’s distraction. They were asked “Do you think that students e-tasking can be a distraction to a professor?” and “How does this affect the class learning experience?” The students’ open-ended response categories are seen in the chart in Figure 6. Many ‘Yes’ responses were also coupled with stronger terms like ‘definitely’, ‘of course’, and ‘very much so’, indicating the strength of the affirmative responses. No one replied ‘No’ that they did not think that e-tasking could be a distracter, although there were some that felt it ‘Shouldn’t be’.

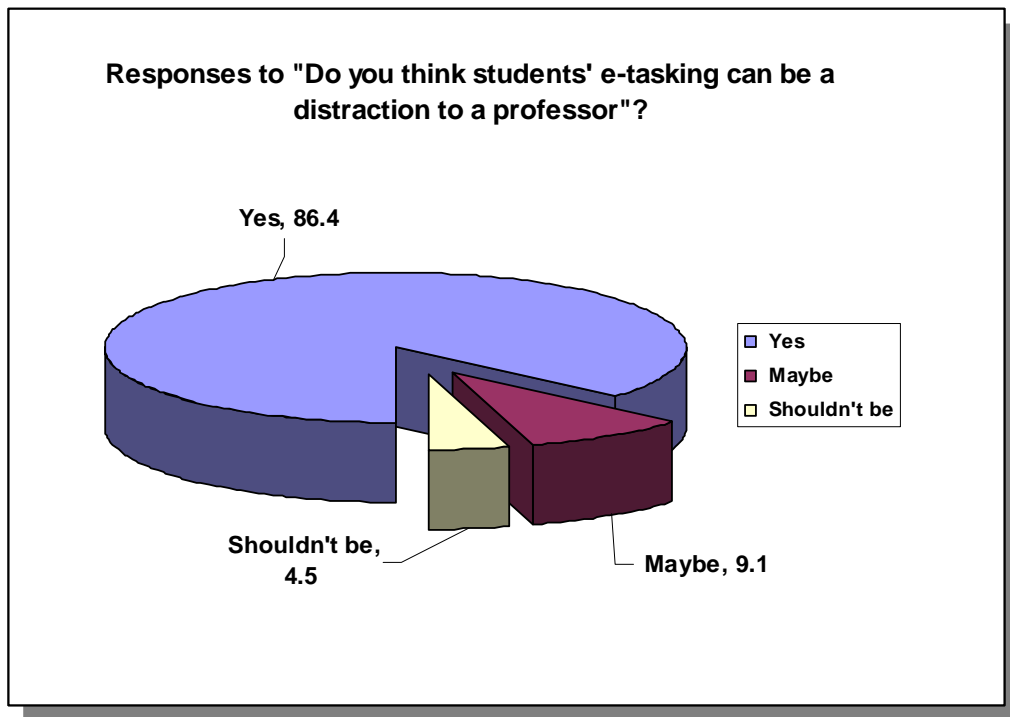


Figure 6. Percentage of responses to whether e-tasking has an effect on a professor.

Content analysis on the narrative responses as to “How e-tasking affects the classroom learning experience” revealed a clear pattern of categories. The breakdown of the content analysis is seen in Figure 7. First, a small group comprising 11% felt it had no effect on classroom learning. Others, about 22%, noted that it was generally inconsiderate and bad manners to e-task in class, but did not comment directly on whether there were any consequences related to the *learning* experience in the classroom. Finally, the remaining 67% made direct references to the detrimental effects of e-tasking in the classroom in terms of learning, teaching, and classroom comportment and tone. The sub categories of this are also seen on the right-hand side in Figure 7 as well.

Comments referring to the professor include the following representative observations:

“It slows [professor] down...” ...It shifts attention away from material to be taught.”
“Teachers become distracted ...” It distracts the professor...”
“[It’s] hard when people are not paying attention...”

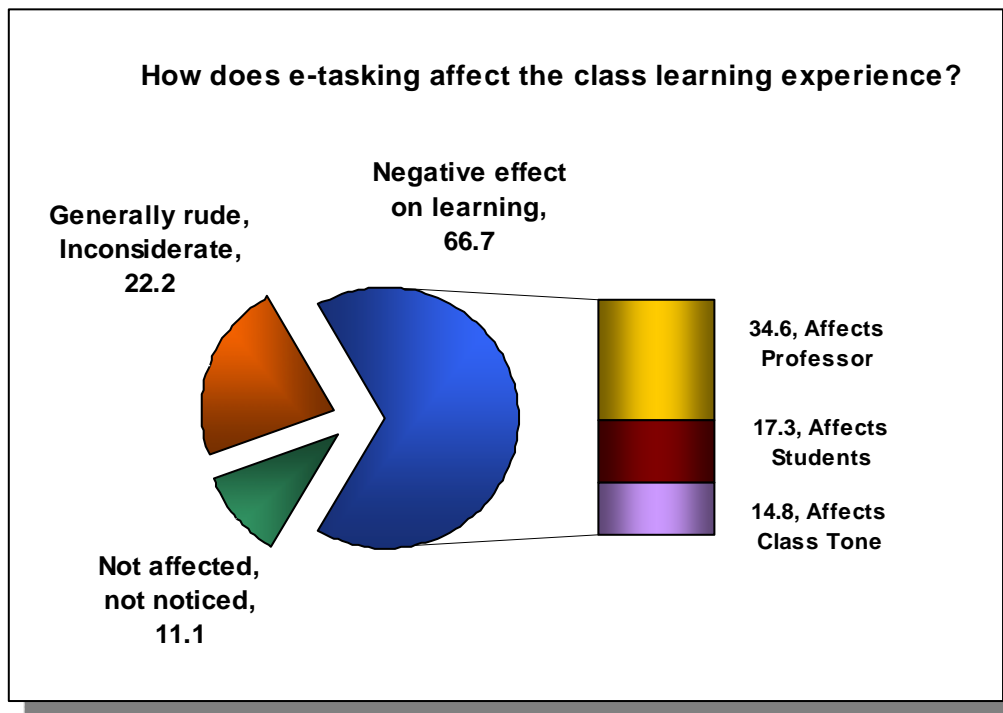


Figure 7. Perceived effects of e-tasking on classroom learning, open-ended responses.

Those who alluded directly to the students’ learning often tied it in with the detrimental effects on the instructor. Others merely commented on how students are affected. Samples of responses are as follows:

“It shifts attention away from material to be learned.” ... “[It] divides people.”
“Students miss valuable information.” ... “It reduces your ability to retain knowledge.”

*“Texting in class may prevent [students] from learning.” ... “It hurts your participation.”
“It definitely disrupts the learning experience.” ... “It distracts students from paying attention.”*

Needless to say, no one thought mult-e-tasking in class was a good thing!

Opinions. Next, students were encouraged to provide their opinions on the topic. One question read, “What is your opinion on being requested to keep phones and non-computer mobile devices off during class and presentations?” An overview of the responses to this question is seen in Figure 8. This inquiry was followed by an invitation to “Provide any other thoughts on the topic”.

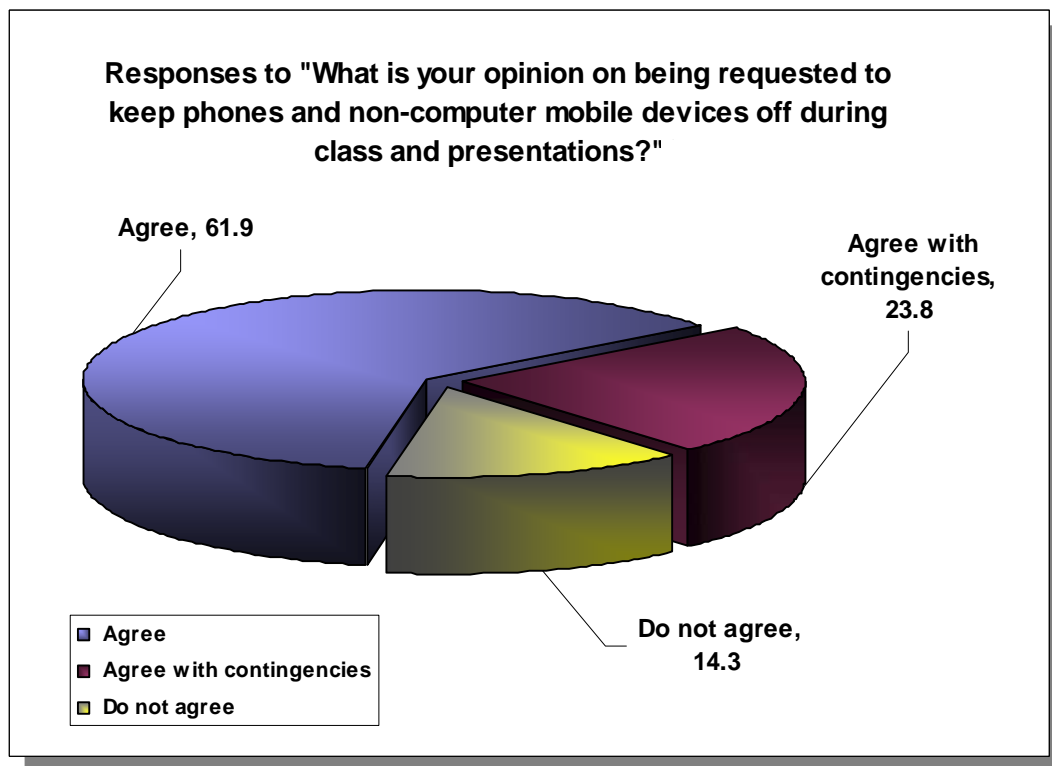


Figure 8. Opinions on beings asked to keep mobile electronic devices off during class.

In the responses, about 86% of them concur with the idea of being requested to keep mobile electronic devices off during class. Nearly 62% of all respondents agree to this unconditionally, with the following being examples of the commentary:

“It is perfectly fine”, “good”, “fair to the class and the professor”, “perfectly reasonable, expected”, “necessary”, “justified” ... and, “I prefer it.”

There were ~24% who agreed with the notion of disallowing e-tasking during class, but had some caveats, noting that there may be ‘emergencies’ or ‘important issues’ that would/could be

missed with the phones off, or stated that they agree with the request in theory, but will still keep their phones on regardless.

The remainder of respondents –about 14%– would resist being requested to keep phones and other mobile devices off, some with very strong objections and concerns, favoring the word “annoying” in their explanations:

“I find it annoying and insulting. Since I have the right to bring whatever I want to class and a cell phone shouldn’t be a big deal or distract to the professor.”

“I think it's annoying to be asked to keep them off, so I never actually turn them off.”

“We should be able to have laptops. Phones should be on silent. Texting should be at the students' discretion”.

“I have a very low boredom threshold and I sometimes need to do something else.”

“It may help us to focus, but some may be distracted by thinking about checking their phone even if it's off.”

In giving their opinions about the prospect of a phones-off directive 25% of the open responses (agree or disagree) directly made mention of emergencies and 14.5% mentioned concerns about missing important issues, critical information, or needing to be contacted.

Behavior Changes. Nine months after the study was completed, the same class members were asked to respond to the question, “After having been a participant in a study on the detrimental effects that multitasking has on learning in the classroom, what if any behavioral changes have you made in your subsequent classes?” Sixty percent of respondents replied with “yes” while forty percent responded with “no”. All included some interesting comments.

For those responding with “yes” the common threads seemed to be that they are now managing their multitasking better and certainly more aware of the consequences.

“Yes. Although I was not an avid texter/web surfer prior to the study, I have now become more aware of and annoyed by the behavior of others who choose to ‘multitask’ in class.”

Yes. This semester I think I have developed better self control and haven't multitasked as much as I used to.”

“In GE 1111, I had never actually multitasked but the study definitely influenced my judgment in determining which future courses I could try multitasking and get away with it.”

“I have definitely changed my behavior. I have fine-tuned my multitasking to reflect the amount I do based on the course load of the class that I am in. e.g. when I am in my organizational behavior class, I am always looking up the news sites, etc. but when I am in my biology class, I actually switch my phone off.”

For the respondents who answered “no” the emerging themes were either that they felt able to manage the amount of multitasking with no unfavorable effects on their learning or that they simply never multitasked in the first place.

“No, in regards to my performance in those classes I use my phone in, I have to say that using my phone in class does distract me sometimes, but I feel like I can manage that. I’ve been doing well in my classes even though I check my phone occasionally.”

“No, my behavior in regards to multitasking haven’t changed at all since participating in the study. I did very well on the quiz even though I had been checking my phone and responding to messages. The same is true for me now, I always keep my phone out in front of me in most classes just to check the time or to respond to quick messages, and even to keep me interested if the class happens to be boring. Some of my professors this semester do not like phones to be out at all, so I don’t use it in those classes.”

“No. But I never used my phone during any classes to begin with.”

“No, I never really “multitasked” during GE1111.”

So it seems that the study has affected the behaviors of some in a positive manner while for others it at least offers an avenue of reflection on the possible consequences of multitasking in the classroom.

Management Strategies

Our students are undoubtedly over-stimulated with all of the available technology around them. When they enter our classrooms they must undergo a transformation –enter culture shock. All of the connections to their outside world are now broken and they must focus their attention on the lesson at hand. They undeniably become under stimulated at times. Unless we integrate a comedic standup routine into our lecture we wonder if we will lose a few students to the perils of e-tasking. How do we manage to keep this generation of e-taskers engaged in the classroom? One school of thought is to transform our lectures to appear more like what they experience in their daily lives in order to keep them engaged. This is a generation of learners by trial and error.⁵ Most will rather spend time trying to figure out how something works by just hitting buttons aimlessly than to take the time to read an instruction manual. Their personalities need to be leveraged in the classroom giving them the opportunity to try things out, for instance using hands-on activities.

Another school of thought is: ‘If you can’t beat them, join them’ and some have certainly tried. Harley *et. al.* (2010) tried to use social networking for positive academic purposes.¹³ For example, they encouraged their students to transfer their attraction for virtual interactions to the physical classroom, thereby removing the boundaries between the online world and the academic one. Using media such as Blogs, Facebook, YouTube, and Web 2.0, the faculty made the connection. While there were some effective elements of this approach, the results of the related survey data highlighted concerns of distraction, privacy, faculty intrusion in students’ online personal lives, and the unnecessary overlap of these and existing course software. The authors

conclude with “while these technologies do show potential, many faculty and students are simply unready or unwilling to adopt them for academic purposes”.

Another study involved using cell phone texting as an audience response system transmitter.²³ Many companies now provide a service to collect survey data and instantaneously report results by simple texting to a number set up before hand. Results found benefits without introducing significant distractions and that the students enjoyed reporting solutions to group problems by text message. In addition the instructor found that having results electronically collected and displayed sometimes facilitated better discussion which has been reported in previous publications on the use of clickers. The downside was that since everyone had their phones out, there was the concern that unrelated cell phone use in the classroom (text messaging, email, internet browsing) was likely higher than usual during in-class activities. The author states this type of use was not widespread or perceived as a distraction by the students or instructor but this is certainly dependent on the personalities of those in the vicinity of the users and would be not be taken as the norm. It is expected that there will be some that are distracted.

So it seems that we have not yet crafted the ideal approach with this generation –with the need for instantaneous and constant communication and immediate gratification. A place to start which might offer a means to be more successful would be to identify specific traits prevalent within the generation of interest and target them with engaging in class activities that will feed off of their need to use technology. An exceptional survey was conducted by Berk (2009) which compiled information obtained about characteristics of Net Gens (dates born 1980 – 2003) from 10 national and international surveys, over 30 textbooks and scores of articles.⁵ The author was able to summarize traits and map them to teaching strategies, a few of which are described below. Naturally, each strategy will have advantages and disadvantages as was found in the previous two citations and by no means is this a complete list but rather a starting point to help jump start the discussion of what do we do!

According to the survey findings, Net Gens are “tech savvy”, “rely on search engines”, “are interested in multimedia”, “operate at twitch speeds”, “multitask”, “are experiential hands-on learners”, “work by trial and error”, “communicate visually”, “emotionally open”, “prefer teamwork and collaboration”, “thrive on instant gratification” and “respond quickly”. They view the world in a global context and embrace diversity, and with the openness of the internet are active information seekers as well as generators.⁵

Themes to address these characteristics include: integrating technology into lectures and homework such as videos and music, posting class notes on the web; assigning and collecting homework electronically; using simulation technologies; podcasting; using search engines with exercises to think critically about the information gathered; allowing for students to learn at their own pace in as many engaging activities as possible to avoid boredom, using self-paced learning modules; shortening stretches of lecture and include active learning, engaging in experiential learning and learning-centered teaching, which allow for the discovery and construction of knowledge; allowing students to design and test their own problem solving strategies, promoting education as a social activity, encouraging interactions face to face, online though discussion boards, using wikis, IM, blogs and social networks; creating opportunities for teamwork through the use of projects, debates, peer review, role playing and presentations; being quick to respond

to emails, having dedicated IM time and striving to return homework, exams and quizzes quickly.^{3,5,14,20,22,28,31}

Finally given the fact that the students do report an understanding that using electronic devices is detrimental to their learning and a distraction for themselves, for those around them and for the Professor, it may be wise to incorporate this into any strategy. Educating and reminding the students may have some effect on their behavior over time. Students should have a focus on learning and performance (grades) and this may be utilized in this context. Just as limits or rules are set in many environments and activities to create the best outcomes, we should now establish limits for the optimal learning environment.

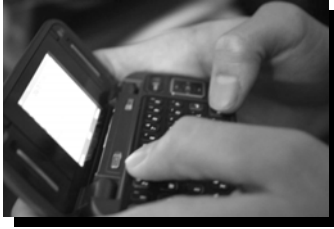
Conclusions

Despite the cultural perception that manifests with our students, individuals are capable of concentrating on only a limited number of things at a time and even that limit depends upon the type of tasks being performed. Results of this work clearly confirm that participating in e-tasking behavior results in a statistically significant drop in retention of information. Numerous studies have been conducted to study the persona of the current generation and how to best integrate an understanding of their traits into the classroom in order to keep them engaged. Many of these techniques do have tradeoffs but to do nothing will lead to uninspiring classes and a student population that will tune us out. We must embrace and simultaneously manage technology that this generation views as critical to their success, happiness, and productivity. We need to always remember content and competency first and foremost; however these critical components must now be realigned in order to connect to and meet the expectations of a different generation.

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APPENDIX A: E-Tasking Questionnaire

For this questionnaire, **mobile device** will mean cell phone, Blackberry, iphone, SmartPhone, and/or any other small portable interactive device with WiFi connection, coverage, and communication capabilities (but not a laptop); **e-tasking** will mean carrying out activities on the mobile device, such as sending, receiving and/or checking for messages, reading email and/or browsing the web while class or a presentation is underway.

Gender: Male Female Age: Years Months
 _____ _____

1. You listened to a guest speaker today. Realistically, what % of the speaker's content did you retain?

Practically none Only a little Just less than 1/2 About half of it A bit more than 1/2 A large percent Nearly all of it

2. Do you own a cell phone/mobile electronic device? Yes No ← If No, skip to Question #7

3. Did you have a cell phone/mobile device with you during the class presentation today?

Yes, it was fully on. Yes, but it was on silent mode. Yes, I only switched it on to check it briefly. Yes, but I switched it off for class I did not have it with me today.

4. In general, do you bring a cell phone to class/campus?

Practically never Some of the time About half the time Most of the time Just about always

5. Did you use your cell phone/device during today's class/presentation? Check all that apply and fill in blanks:

Yes, I received text messages. <input type="checkbox"/>	Yes, and I replied to messages. <input type="checkbox"/>	Yes, I initiated texts (not a direct reply). <input type="checkbox"/>	Yes, I checked email and/or browsed online. <input type="checkbox"/>	I had no phone activity during class time today. <input type="checkbox"/>
How many? _____	How many? _____	How many? _____	Email ___ Surfed ___	

6. In general, do you e-task (text/email/check messages and/or surf the web) during class/presentations?

Practically never /
I plan not to

Once every
few classes

About once every
couple classes

I may average
once per class

I average a couple or
more times per class

7. Have you ever been distracted from focusing or learning by those near you who use their mobile devices during class?

I have not noticed it
happening near me.

It never/hardly bothers
me when it happens.

It sometimes can
be distracting.

Quite often I find
it distracts me.

Just about all of the time
it happens near me,
I become distracted.

8. Have you ever been presenting while listeners were e-tasking? Please comment on this experience:

9. a. Do you think that students' e-tasking can be a distraction to a professor?

b. How does this affect the class learning experience?

10. What is your opinion on being requested to keep phones and non-computer mobile devices off during class and presentations?

Any other thoughts on this topic:

~Thank you!