You Say Multitasking Like It's a Good Thing

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Multitasking has developed a certain mantra in our culture, repeated and indiscriminately accepted so often that it has become a commonplace-not only in colloquial conversation, but among normally astute academics.

According to this widely held axiom, people in general, and our students in particular, can and do function productively and learn efficiently doing several things at once. Scarcely a day goes by, it seems, that we do not hear at least one of our colleagues mention the ubiquitous "m" word.

Our hipper, more progressive (and perhaps younger) colleagues brag about their prowess at juggling many tasks simultaneously, while our more seasoned colleagues often bemoan their inability to master this elusive and mind-muddling aptitude. For

almost everyone, however, there is the unshakable conviction that our young students excel in a multitasking environment.

In what follows, I try to refute the presumed efficacy of multitasking by drawing on the results of some of the recent neurophysiological experiments. I also examine the concept of multitasking itself, of which the analytical philosopher in me demands a more careful scrutiny than what is usually conducted in more casual conversation.

I eventually conclude that multitasking, as we ordinarily understand it, is both impractical and counterproductive to successful conceptual learning and scholastic education.

The term "multitasking" was coined in the computer engineering industry. In that context, it denotes the ability of a microprocessor (the "brain" of a computer) to process several tasks simultaneously. Ironically, even the paradigmatic use of this term is demonstrably false. Microprocessors, as well as their current programmable cousins, cannot literally perform several tasks simultaneously.

They are inherently linear in their operation and can perform only one task at a time. This simple fact explains the justification for the dual-core and quad-core microprocessors in current PC applications, where it is deemed advantageous to have multiple microprocessors literally running simultaneously to increase operational speed in computer operations.

But even here, the notion of simultaneity breaks down when we note that the several microprocessors in a multi-core system must occasionally interrupt each other for purposes of synchronicity in PC operations.

For certain kinds of behavior, brains (like microprocessors) are essentially linear devices that are incapable of performing two separate tasks simultaneously. In a more colloquial sense, though, it seems quite obvious that people are capable of at least some level of simultaneous activity.

After all, it's only the rare klutz who is called out for not being able to "walk and chew gum at the same time." And certain types of tasks truly can be performed simultaneously.

Most of us are quite capable of riding an exercise bike and listening to music at the same time. What is far less obvious is our ability to engage in conceptual learning-the

type of learning we expect to foster in the classroom-along with other simultaneous activities, such as watching television or text messaging.

When I use the term "multitasking," I refer to an attempt by individuals to engage in several tasks in rapid linear succession (rather than simultaneously) where at least one of the tasks is a conceptual learning activity.

Implicit in this understanding of multitasking is that the performance of multiple activities will entail frequent interruptions to segue from one task to another, as well as the ability to pick up where one previously left off-a model that directly mirrors the type of multitasking carried out by microprocessors.

A cursory survey of recent references to multitasking, especially in the typically non-technical realm of Web blogs and other non-professional postings on the Internet, exposes an interesting dichotomy in general attitudes about the presumed upside of multitasking.

Those who extol the virtues (or at least proclaim the necessity) of multitasking behavior seem typically to constitute three non-technical and non-professional communities: career professionals already saddled with overwhelming job-related expectations; young students who seem intent on justifying their "attention deficit" practices; and, interestingly enough, academic administrators and humanities educators.

When one turns from these non-technical discussions to the more research-oriented milieu of the neurophysiologist, one quickly learns that multitasking is not at all the handy panacea for "too much to do and too little time to do it" that it's often purported to be.

In fact, recent experiments provide strong evidence that multitasking is counterproductive, particularly when at least one of the tasks involves higher-level conceptual learning. As one Wall Street Journal columnist quips, multitasking is "the wellspring of office gaffes, as well as the stock answer to how we do more with less when in fact we're usually doing less with more.

What now passes for multitasking was once called not paying attention." The most convincing of these recent studies succeeded in exposing three fundamental myths that have arisen about the virtues of multitasking.

Myth ONE:

Multitasking Saves Time

In a study published in the Journal of Experimental Psychology, Joshua Rubinstein, David Meyer, and Jeffrey Poldrack discovered that people who multitask actually prove more inefficient than people who focus on one task at a time. Because our brains are incapable of performing two conceptual tasks literally simultaneously, the process of multitasking entails our alternating rapidly among the various projects.

As with a microprocessor, the interruption of one task requires us to remember where we stopped, so that when we return to this task we can resume the activity. The same is true, of course, for the alternate task(s). Now, whereas microprocessors are quite efficient at storing and retrieving these interruption points, brains are decidedly not. They discovered that the time lost while the brain continually reorients itself during the stop-and-go process increases with the complexity and relative unfamiliarity of the tasks, and takes longer when the switching period is extended over a longer time period. In short, multitasking proves less efficient than performing the same tasks one at a time.

The explanation for our apparent inefficiency in switching back and forth between projects has to do with the manner in which our brains process conceptual or higher-level information.

Using functional magnetic resonance imaging experiments, researchers in a recent study published in Neuron were able to identify those areas of the brain that are responsible for the so-called bottleneck that impedes our ability to perform more than one conceptual task at a time. This bottleneck effect helps explain the critical limitations to our ability to carry out higher-level multitasking.

Let us grant that multitasking of higher-level projects may take longer than their completion in a linear fashion. Still, learning is learning, regardless of how long it takes to acquire, right? So what's the problem with students texting, surfing the Web, listening to music, and so on while attending a lecture, or working on homework?

Myth TWO:

Multitasked Learning is as Good as Single-Task Learning

Recent neurophysiological experiments expose the fallacy of this presumption about multitasking. In a study funded by the National Science Foundation and published in the Proceedings of the National Academy of Sciences, Karin Foerde, Barbara J. Knowlton, and Russell Poldrack discovered that even if learning is possible in a frequently interrupted environment-like that inherent in the process of multitasking-such learning has a different cognitive status than that of uninterrupted learning, and is actually less efficient and useful than uninterrupted learning.

According to the article, brains acquire learning in two fundamentally different manners. Declarative learning (or what I have previously called conceptual or higher-level learning) involves the hippocampus area of the brain and results in the acquisition of information that can be easily recalled and applied to a variety of new and unfamiliar situations.

Habitual learning (or what is sometimes referred to as procedural learning) on the other hand, occurs in the brain's striatum, and results in learning that is basically automatic, almost subconscious, but much more limited in its applicability to new situations.

The researchers discovered that the brain uses its hippocampus for single-task learning, but diverts dual-task learning to its striatum. Thus, when a person is distracted, habitual learning actually takes over from declarative learning. In this sense, the two types of learning appear to compete with each other.

And because procedural learning is more limited in applicability than declarative learning, it is "inferior" learning, to the extent that it is less capable of being manipulated, organized, and applied to new and unfamiliar situations than declarative learning. In short, multitasking actually changes the manner in which people learn and retain information.

Given the results of this experiment, one can conclude that learning stored in different areas of the brain may well foretell serious limitations on the overall usefulness and future applicability of the stored information. Is it any wonder that professors increasingly bemoan students' inability to analyze and synthesize information, despite the wealth of information available to them?

Myth THREE:

Multitasking, Forte of the Young

Even those reasonably sane and insightful individuals who are loath to accept the touted advantages of multitasking are prone to grant that "we sure can't multitask like the kids today do." Many of us seem almost resigned to the conclusion that, whatever its potential drawbacks, multitasking is now a way of life and, despite our own personal failings, at least young people can multitask effectively because they've grown up doing it.

Therefore, we dinosaurs need to adapt to their method of learning, and adjust our educational practices and expectations accordingly. Fortunately for us dinosaurs, there is now significant evidence that multitasking is not the blessing of youth that it is generally purported to be.

Martin Westwell, deputy director of the Institute for the Future of the Mind, reported on an experiment conducted with two age groups: 18- to 21-year-olds and 35- to 39-year-olds. Both groups were assigned the task of translating images into numbers, using a simple code (an activity requiring declarative learning skills).

When both groups were tested without being interrupted, the younger group performed the task about 10 percent faster than the older group. But when both groups were interrupted by a phone call, instant message, or cell phone text message, the older group matched the younger group in both speed and accuracy.

Westwell concludes that although older people may process information more slowly than younger people, they seem to have a "faster fluid intelligence," so they are more adept at blocking out interruptions and deciding what to focus on.

We should not draw the conclusion from this research that every age group is equally gifted with the skill of multitasking, only that young people have no advantage or special edge over those who are older when it comes to multitasking, despite their lifelong acquaintance with such efforts, and despite anyone's inclination to believe otherwise.

Like many stories that if repeated often enough become accepted as unquestionably true, multitasking has an aura that people seem to find irresistibly appealing. In her news article, "Multitasking Wastes Time and Money," Megan Santosus writes:

"Unfortunately, even in the face of the mounting scientific and anecdotal evidence (not to mention individual blood pressure and stress levels) that multitasking doesn't work, companies cling to it like shipwrecked survivors to flotsam.

They believe that asking employees to multitask saves them money and time when chances are good that it will do neither."

The false hopes raised by multitasking are unfortunate enough in the business environment. But they are possibly more pernicious in academia. These false hopes purport to justify all sorts of counterproductive behavior that may seem too universally accepted to rebel against, such as allowing laptop computers and cell phones into the classroom when we know that such devices will interfere with instruction.

What drives the persistent faith in the efficacy of multitasking? Perhaps it is the illusory dream of getting something for nothing; the hope of accomplishing increasing numbers of activities in the time that was formerly wasted on just one task.

Or perhaps we have created a culture, complete with myriad diversions and nifty electronic devices, in which there is simply too little time to do everything we need and want to do. Perhaps we are unable to set priorities for optimal use of our time for fear of missing out on some fascinating activity or other.

Whatever the case, the implicit acceptance of multitasking as a viable and productive strategy cannot, and should not, be encouraged in the academic environment-at least not if we hope to maintain the level of educational efficacy of generations past.

The consequence of tolerating these behaviors is an education that is fundamentally superficial, short-term-memory-based, and limited in its adaptability to new circumstances. We are, unfortunately, already seeing some of the effects of this practice in our classrooms. To further encourage this practice-discredited by significant neurophysiological testing-is to invite academic implosion.

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Master Multitaskers or Just Distracted Students?

Are you mystified when students complain about spending hours on a homework assignment that should have taken about 30 minutes? Remember, your students are likely working under the same assumptions about multitasking as most of the rest of us, thinking they can listen to their iPods, IM their friends, and solve those trig equations at the same time.

But reviewing the latest neurological evidence that suggests otherwise might not be the best way to show your students that multitasking is a myth. Let them see for themselves by trying the following exercise in class:

Remove the face cards from a standard deck and select 15-20 random numbered cards. Have your subject mentally add the black cards and subtract the red cards from a running subtotal as quickly as possible, while being timed. (Younger students simply may add all card values.)

Next, call off a list of 15-20 random alphabetic characters while the subject mentally keeps track of the number of vowels recited, while being timed. Then add the times of both exercises.

Finally, repeat the first experiment, but this time interrupt the subject's addition periodically with recited alphabetic characters, while the student attempts to keep track of both results simultaneously. Odds are that the final experiment will take measurably longer than each exercise conducted individually. (It is likely that the final experiment will yield fewer correct answers, besides.)

In a recent study conducted by Paul Dux, Jason Ivanoff, Christopher Asplund, and René Marois, using MRI testing, the researchers discovered a neural "bottleneck" in the brain's processing of (nearly) simultaneous tasks. The bottleneck delay increases with the complexity and unfamiliarity of the tasks performed, and with the frequency of interruptions. Their conclusion: The brain itself impedes our ability to carry out higher-level, or conceptual, multitasking.

The results of your in-class experiment just might convince your students that concentrating on the task at hand will result in far fewer "hours of homework".which will result in more time for the 500 other things they'd rather be doing.

Reference

Dux, Paul, Jason Ivanoff, Christopher Asplund, and René Marois, "Isolation of a Central Bottleneck of Information Processing with Time-Resolved fMRI." Neuron, 52 (December 20, 2006), 1109-20.

Bibliography

American Psychological Association. "Is Multitasking More Efficient? Shifting Mental Gears Costs Time, Especially When Shifting to Less Familiar Tasks." August 5, 2001.

Dux, Paul, Jason Ivanoff, Christopher L. Asplund, and René Marois. "Isolation of a Central Bottleneck of Information Processing with Time-Resolved fMRI." Neuron, Vol. 52 (December 20, 2006): 1109-20.

eSchool News Staff. "Study: Multitasking Hinders Learning," July 26, 2006. www.eschoolnews.com/news/showstoryts.cfm?Articleid=6453.

Foerde, Karin, Barbara Knowlton, and Russell Poldrack. "Modulation of Competing Memory Systems by Distraction." Proceedings of the National Academy of Sciences, 103, 31 (August 1, 2006), 11778-83.

Lohr, Steve. "Slow Down, Brave Multitasker, and Don't Read This in Traffic." The New York Times, March 25, 2007.

Rubinstein, Joshua, David Meyer, and Jeffrey Evans. "Executive Control of Cognitive Processes in Task Switching." Journal of Experimental Psychology, 27, 4 (2001): 763-97.

Sandberg, Jared. "Yes, Sell All My Stocks. No, the 3:15 From JFK. And Get Me Mr. Sister." The Wall Street Journal Online, September 12, 2006.

Santosus, Megan. "Multitasking Wastes Time and Money." CIO, September 15, 2003.

Wallis, Claudia. "The Multitasking Generation." Time, March 19, 2006.

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