Strategies for addressing issues involving our digital devices

In the past year several books as well as articles from a wide range of news media — from the **New York Times** and **Wall Street Journal** to the **Utne Reader**, **Scientific American**, and **Phi Delta Kappan** — have raised a number of concerns about our increasing use and dependence on our smart phones, iPads, laptops, tablets, e-readers, and computers. These concerns are raised in relationship not only to teachers and educators, but to other professionals, including doctors, airplane pilots, architects, and engineers, as well as parents and caregivers of young people.

There also are critical issues regarding the materials used in the manufacture of our digital devices, particularly the rare earth metals, and the environmental dangers involved not only in their production, but in the health risks of the laborers mining these substances. [I will not go into environmental issues here, but for a discussion of these and recommendations on recycling your electronic hardware, I suggest you visit the "Sustainable Materials Management" section of the Environmental Protection Agency (EPA) website at http://www.epa.gov/smm/electronics/index.htm.]

In this article I will review and summarize key research and focus on

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what can be done, including concrete suggestions and recommendations for teachers and parent/caregivers, and for all of us, as we work our way through this new age. And let me make it clear at the outset — I am a user of these devices. I'm typing this on my laptop, and have a cell phone which I use not only for phone calls, but for directions on how to find a particular store, to send a text message to a family member, to contact colleagues at NSRF and participants in my CFG communities. I'm seeking to understand the issues involved, to find a balance in my use of these devices personally and professionally in the hope that my findings may be of use to you readers as well.

Information about information

I'll start with some basic information about "information" from the latest book by Daniel Levitin, **The Organized Mind: Thinking Straight in the Age of Information Overload**. Levitin is a professor of psychology and behavioral neuroscience at McGill University. Information scientists have quantified the incredible growth and expansion of information available to us today:

"In 20ll, Americans took in five times as much information every day as they did in 1986 — the equivalent of 175 newspapers. During our leisure time, not counting work, each of us processes 34 gigabytes of 100,000 words every day. The world's 21,272 television stations produce 85,000 hours of original programming every day as we watch an average of 5 hours of television each day, the equivalent of 20 gigabytes of audio-video images. That's not counting YouTube, which uploads 6,000 hours of video every hour. And computer gaming? It consumes more bytes than all other media put together, including DVDs, TV, books, magazines, and the Internet… Each of us has the equivalent

of over half a million books stored on our computers, not to mention all the information stored in our cell phones or the magnetic stripe on the back of our credit cards. We have created a world with 300 exabytes (300,000,000.000,000,000,000 pieces) of human-made information."

This is but one of several references reinforcing the subtitle of Levitin's book, that we are in an "age of information overload." The overload is compounded by the limited processing capacity of our conscious mind; estimated at 120 bits per second, the bandwidth or speed limit for "the traffic of information we can pay conscious attention to at any one time." Since we need to process 60 bits per second to understand one person speaking to us, we can effectively really understand only two people speaking to us at one time. Additional recent research at Stanford University also indicates people can't actually "multi-task," or do more than one task at a time. Rather we engage in "task switching," doing one thing, then switching to another, and thereby may lose up to 40% efficiency at the work we're doing.

Issues in other professions

Before focusing particularly on education, teaching and learning, here briefly are examples of how problems related to over-dependence on digital devices are being addressed in some other professions.

Nicholas Carr (writer-in-residence at the University of California, Berkeley, and an executive editor of the Harvard Business Review), in his book, **The Glass Cage: Automation and Us**, refers to the cockpit of commercial airliners as the "glass cage." After describing various airline accidents attributed to over-reliance on autopilot (planes being flown by computer rather than under the control of human pilots), Carr refers to research indicat-

ing the critical importance of pilots' regularly practicing in flight simulators and flying their planes manually, disconnected from the auto-pilot.

Regarding the medical profession, recent research studies have shown that primary-care physicians who had adopted computerized diagnostic systems felt "the software was impoverishing their understanding of patients, diminishing their ability to make informed decisions around diagnosis and treatment.'" Such studies caution doctors about becoming overly constricted when "screen-driven" by computers' prompts, rather than the narrative input from the patient to make informed decisions regarding diagnosis and treatment. They found that "medical software is no replacement for basic history-taking, examination skills, and critical thinking."

Many architects increasingly rely on "computerized tomography design" (or CADs) rather than paper and pencil, manual skills. In a study done at the University of Miami, "modern computer systems can translate sets of dimensions into precise 3-D renderings with incredible speed, but they also breed 'more banal, lazy, and uneventful designs that are void of intellect, imagination and emotion.'" Thus, increasingly architects are returning in part to their sketch pads to imagine creative new possibilities in addition to the information from CADs.

How about the rest of us?

An article in the December 2013 issue of *Scientific American* by two Psychology Professors at Harvard University, "How Google Is Changing Your Brain," summarizes findings as follows: "With nearly ubiquitous online access, many people may first perform a smartphone search rather than calling a friend. Being online all the time changes the subjective sense of self as borders between personal memories and information distributed across the Internet start to blur."

In *Virtually You: The Internet and the Fracturing of the Self*, Elias Aboujaoude, (Director of the Impulse Control Disorders Clinic at Stanford University), says, "More and more, life

is resembling the chat room; we're paying a price in terms of our cognitive life because of this virtual lifestyle." An article in the 6 June 2010 issue of the New York Times referencing Aboujaoude's and others' research, "An Ugly Toll of Technology: Impatience and Forgetfulness," the concern is raised that "excessive use of the Internet, cellphones and other technologies can cause us to become more impatient, impulsive, forgetful and even more narcissistic," leading to "Internet dependence" and even "addiction."

Then there is the *Scientific American* interview with Michael Harris, author of *The End of Absence: Reclaiming What We've Lost in a World of Constant Connection*, in which he suggests that modern technology, especially the smartphone, has taken certain kinds of "absence" from our lives, and eliminated our time for solitude and daydreaming, filling even short moments of quiet with interruptions and distractions.

Several others' research agrees that our brains need "down time," where we are disconnected from all technology, and recommends strongly that we take a week or a month off from all technology to experience life more directly, the outdoors, our free-roaming creativity, and imagination. Such "down time" seems particularly crucial for those adolescents who have become compulsive cellphone users, resulting in the inhibition of their deep thought, causing anxiety, a false sense of urgency, loss of focus, and poor decision-making.

Now, for education, teaching, and learning

Here's a quote from Angela Walmsley, Associate Dean at Northeastern University-Seattle in Seattle, Washington, from in an article entitled, "Unplug the Kids," in the March 2014 issue of the educational journal, *Phi Delta Kappan* Does any of the following sound familiar to you as a teacher and/or parent/caregiver?

"My elementary-aged children would rather stay inside and watch TV or play on the IPad than go outside and run around, play catch, or ride

a bike. My middle school child could play Minecraft for six hours without stopping to eat, and my friends' middle school children prefer to text each other from next door or even the next room to talking face-to-face. My neighbors' high school children don't leave their bedrooms at night or weekends because they can FaceTime or text their friends while doing homework or playing video games."

Looking first at teaching reading, and then writing, I turn to Maryanne Wolf, professor of child development at Tufts University and director of the Center for Reading and Language Research. In Wolf's recent book, *Proust and the Squid: The History and Science of the Reading Brain*, she calls for educators to "balance technology and 'deep reading' to create bi-literate children," where every child has not only a repertoire of digital skills, but also, over time, develops the "deep reading skills" of an expert reader. This deep reading involves progressing from reading that involves getting new information off the page to "adding background knowledge to inference and analogy, induction and deduction, perspective, and critical analysis,"… go(ing) ever deeper into our own insights, (where) we sometimes reach epiphanies beyond any information from the author."

Similar concerns about what is happening to young people and their reading abilities in the digital age are raised by extensive research in an article in the 11 April 2013 issue of *Scientific American,* "The Reading Brain in the Digital Age: The Science of Paper versus Screen."

"In the U.S., e-books currently make up between 15 and 20 percent of all trade book sales….Even so, evidence from laboratory experiments, polls and consumer reports indicates that modern screens and e-readers fail to adequately recreate certain tactile experiences of reading on paper that many people miss and, more importantly, prevent people from navigating long texts in an intuitive and satisfying way. In turn, such navigational difficulties may subtly inhibit reading comprehension. Compared with paper,

screens may also drain more of our mental resources while we are reading and make it a little harder to remember what we read when we are done."

Wolf explains further and cautions, "With a digital device instead of their imaginative imaging, they just push a button and see a scene. I don't want that from the start. I want to evoke their own imagination, their own thought."

Briefly, then, regarding writing, although the Common Core Standards only call for the teaching of legible writing in kindergarten and first grade, with the shift then to developing keyboard skills, new research from a number of universities (including College de France in Paris, Indiana University, the University of Washington, and UCLA) call this standard into question.

In a recent article summarizing this research in the 2 June 2014 issue of *The New York Times*, "new evidence suggests that the links between handwriting and broader educational development run deep. Children not only learn to read more quickly when they first learn to write by hand, but they also remain better able to generate ideas and retain information."

Similarly, looking at academic writing, Mike Schmoker (well known educational writer, speaker, consultant, and author of such books as *Results Now* and *FOCUS: Elevating the Essentials to Radically Improve Student Learning*) states, "Every study of writing indicates that students write very little and receive even less instruction in academic, argumentative writing despite the immense effect such writing has on intellectual development and readiness for post-secondary studies." And here Schmoker is particularly concerned about closing the "income gap," addressing the learning gap between the rich and poor.

Expressing similar concerns related to the "racial achievement gap," where lower reading and writing development are increasingly evident among students of color, particularly given the contributing seductive role of digital media, Professor Ellen Wartella at Northwestern University did a comprehensive study, entitled, "Children,

Media and Race: Media Use Among White, Black, Hispanic and Asian American Children." She found these youth, ages 8 to 18, consume an average of 13 hours of media content a day, almost 4 ½ hours more than their White counterparts. Additionally, students of color are especially avid adopters of new media, spending about 90 minutes more each day than White youth using their cell phones, iPods and other mobile devices to watch TV and videos, play games, and listen to music. Thus, Schmoker states:

*"We may never overcome the effects of poverty on education outcomes. And we must continue to fight for enlightened economic policies that maximize general prosperity and reduce poverty. But make no mistake: We will prepare historic proportions of students for college, careers, and citizenship when we commit to **massive increases in the amount of purposeful, close reading, discussion and writing** they do in school, from the earliest grades and in every discipline." [emphasis mine]*

Using digital devices effectively in education

In closing, I want to return to Daniel Levitin and his key point implied in the book's title, the "organized mind." We need to use as many external resources as possible to help us deal with all this information overload:

"The brain organizes information in its own idiosyncratic way, a way that has served us very well. But in an age of information overload, not to mention decision overload, we need systems outside our heads to help us. Categories can off-load a lot of difficult work of the brain into the environment…. Calendars, smartphones, and address books are also brain extenders, externalizing onto paper or into computer chips myriad details that we no longer have to keep in our heads. Historically the ultimate brain extenders were books, keeping track of centuries' worth of collected knowledge that we can access when we need it. Perhaps they still are."

Reading that passage, I was reminded to consider how many decisions

every educator must make on the spot in a single class period!

Levitin also mentions the surprising number of people in all kinds of professions who use 3x5 index cards to help organize their lives! Personally, I use them all the time, carrying several in my pocket for jotting down notes to remember, things to buy, people to contact, calls to make!

Returning to Angela Walmsley, she answers her own question, "What happens to our society as the virtual world becomes the default mode of communication in the real world? In order to become democratic engaged citizens, children need a balance of face-to-face time and interactions in conjunction with our virtual world."

Additionally, the American Academy of Pediatrics recommends the following "tips" for parents/caregivers:

1) Avoid TV and other entertainment media for children under age two.

2) Monitor your child's media use.

3) Limit entertainment media to one or two hours per day for all children.

4) Make sure that entertainment is of high quality.

5) Create "screen-free zones" at home including no TVs in bedrooms.

6) Turn TV off during meal times.

7) Teach children using non-electronic formats such as books, newspaper, and board games.

8) Encourage outdoor play, reading, hobbies and using one's imagination.

Digital devices aren't going away. How do we use them without ill effects?

Clearly, computers and all sorts of digital devices add considerable benefit to our lives, yet we should be conscious about our use and its cost.

Please email us to let us know your thoughts on addressing issues of technology and the role of our digital devices in education.