to the tune of $2.2 billion a year. When Stanford University's CREDO project tracked four years' worth of reading scores for more than 73,000 Pennsylvania charter school students, it found 100 percent of the cyber school students (who operate entirely online from home) did worse than their public counterparts in school. Colorado's cyber student graduation rate was 12 percent versus 78 percent for public schoolers.

Today's teenager is regularly juggling e-tablets, iPods, smartphones, and laptops, along with a cable-TV in the bedroom. The 2,272 text messages a month in 2008 (for ages 13-17) ballooned to 3,339 by 2010, an average of six per waking hour. Students in one of the most formative periods of their intellectual and emotional lives are interrupted 118 times a day for messages, totaling 90 minutes.

Some experts predict the plasticity of the human brain will allow it to eventually adapt to these multitasking challenges. But neuroscientists found little to be hopeful about.

When tested, adult heavy media multitaskers lost on every count. Scientists found the heavy users struggled to tell what was relevant in what they read, were more easily distracted by irrelevant material, recollections were scrambled, and they were more disorganized in switching tasks.

Simultaneously, the constant connectedness which allows for non-stop downloading, uploading, texting, YouTubing, Googling, or tweeting hundreds of "friends" puts a big wound in creativity. Less "deep thinking" and creativity takes place. Future creative geniuses are un-

likely to come from the ranks of noisy multitaskers.

PAPER VS. SCREEN READING

In his book *The Shallows*, Nicholas Carr devoted a carefully documented 26-page chapter to the hazards of reading online. His findings include:

- Hyperlinked text (underlined text) both slows the reading process and impedes understanding.
- The torrential force of information and diversions facing the Net reader overwhelms the brain, making "distractions more distracting."
- Studies of eye movements while reading online show only 18 percent of a Web page is actually read, with the average page-view lasting 10 seconds or less.

It may come down to this: Reading from the screen is easier and more entertaining while reading from paper leaves a deeper impression on memory. Those differences eventually may push e-reading into what one observer called the "microwave" mode. She recalled how 20 years ago many thought we'd be cooking entire meals in microwaves but now we just use them for warm-ups and popcorn—the big stuff still goes on the stove. Thus we may end up using e-books for easy recreational reading but traditional books for information we need to retain.

This paper is condensed from Chapter 7 of **The Read-Aloud Handbook** *(Penguin, 7th ed.), which includes footnoting and sources for statements made here. For this and other brochure titles, see online:*
www.trelease-on-reading.com/
brochures.html.

E-BOOKS AND E-LEARNING: NOT SO FAST!

Various experts offer sobering Pros and Cons to learning in the Digital Age. It may not be the promised land.
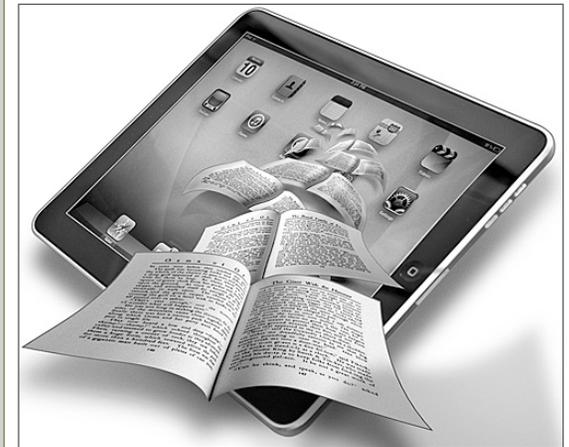
BY JIM TRELEASE

Author of the New York Times Bestseller
The Read-Aloud Handbook

In the spirit of full disclosure, I use digital technology daily: iPad, iPod, laptop, desktop computers, and digital cameras. Let me further note that throughout history, whenever new ideas (like technology) appeared there were "experts" making predictions: Socrates claimed writing would be the ruination of memory; Edison said motion pictures would replace textbooks; college deans declared correspondence courses would revolutionize education; and TV execs predicted "Sesame Street" would solve our literacy woes. All were wrong.

In this brief paper, you will encounter some of today's experts on technology and learning. Some eventually will be right, some will be wrong. We just don't know yet who will be which.

Of one thing we can be certain: *the e-book is here to stay*. It's a money-maker for the publisher and a money-saver for the buyer. It saves time, space, student spines, and trees, to say nothing of what it does for the visually impaired or employees of Silicon Valley. School districts are rushing to equip their students with e-tablets, relieving their spines of 20 daily pounds, while allowing their textbooks to be updated as easily and cheaply as we update our computer operating systems.

And because an e-book has no physical presence or warehousing cost, it can't be taxed as inventory and can stay in print almost limitlessly. This greatly extends the life of books. (Warehousing and taxes were previously shortening those lives.)

Depending on which e-tablet the e-book is on, it can add multimedia to the book reading experience. Our vast video librar-

ies can become resource reservoirs for books. Suppose the class is studying the Civil Rights movement. A hyperlink in the e-text on an iPad could bring up PBS's *American Experience* "Freedom Riders" program that follows the trail of the 400 black and white "riders" who set out to violate Jim Crow bus laws and turn the struggle into a focal point for the entire nation.
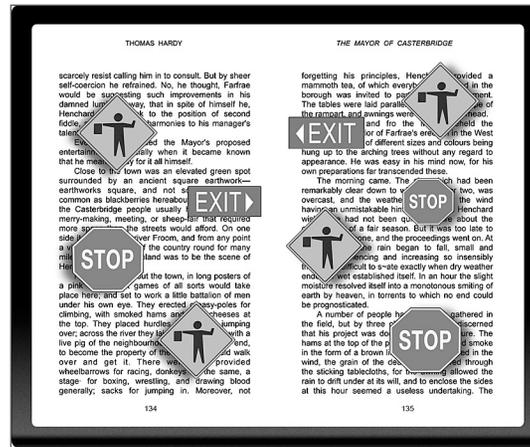
Can the brain overcome all he distractions posed by digital reading?

E-page hyperlinks will bring thousands of *free* tutoring lessons from Khan Academy to any student anywhere in the world. A child in rural Georgia can have the same online tutoring lessons Bill Gates' kids had, though the child's parent might never have owned a credit card.

THE DIGITAL DOWNSIDES

Along with advantages come heavy liabilities and quandaries not shared by printed books. How do you share or loan an e-book to a group of friends? How does a teacher stock her classroom library with e-books? Will there ever be used-e-

bookstores? (Think of how used-bookstores prolonged the life and reach of a book, especially for the poor.)

How soon before e-book batteries become the equivalent of ink cartridges? (*Gotta have 'em, can't afford 'em.* Will the e-book formatting be outdated in five years, requiring us to purchase updated software to reread our e-books? Do software companies have a track record for this? Have you tried using a floppy disk recently?

Studying from print is not like studying from a screen. The research shows that we read more slowly (6 to 11 percent) from a screen than from paper. Unlike paper text (which is like a landscape with roadside markers), e-text is like an ocean—harder to navigate. What we remember best from reading is usually aided by visual and geographic recall. According to research, paper reading better stimulates areas of the brain dealing with emotional involvement and spatial recall, thus leaving a "deeper footprint."

ONLINE LEARNING SCORES

Some experts say Online Learning is the messiah for education. Yet the last decade's results are dismal. The former executive director for education at the Gates Foundation notes, "The data is pretty weak. It's very difficult when we're pressed to come up with convincing data."

In fact, the number of government and independent studies documenting the ineffectiveness of education software to-date is pages long. As a 2012 *New York Times* story noted, education software salesmen have been inflating the e-scores