

Reading and technology:**What's new and what's old about reading in hyperlinked multimedia environments?**

Volume 3, Handbook of Research in Second Language Teaching and Learning

7629 wds inclus. + 102-wd abstract

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Abstract

The nature of text and reading are rapidly changing as ever more reading takes place on computer screens. These changes seem to present new challenges to educators and learners of both first and second languages, and particularly to weak/beginning readers. But on-screen hyperlinked multimedia reading is actually more continuous than different from print reading, which has always created winners and losers and necessitated instruction. This chapter shows what is same and different in the 'new reading' and highlights the role that research can play in both getting the most out of new technologies and preparing learners with the literacy they will need.

1. Introduction

Until quite recently reading and technology would have struck many in education as an arcane topic, of possible interest mainly to CALL (computer assisted language learning) enthusiasts or other techies and nerds. This has changed dramatically given that most people today, especially young people, probably do most of their reading and all of their out-of-school reading on digital screens. There is often no other choice as newspapers shut down their print editions in favour of phone or tablet, and print runs of books are a brief pause on the way to a Kindle or other eBook version (after the Kindle was launched by Amazon in 2007, sales of eBooks overtook sales of print versions in just four years). Whole universities have eliminated paper books from their undergraduate libraries (e.g., The University of Texas at Austin in 2005 and several others since). Reading used to typically involve one individual decoding the carefully edited thoughts of another in linear fashion at some distance of both space and time with little possibility of further interaction, but texts on screens are different in ways that impact the reading process. Screen texts are often authored collaboratively and are not necessarily intended for linear or even complete processing. A typical Web or smart phone document is interlaced with other documents including ads, offers, and distractions, and links to a series of ostensibly related documents via a header or sidebar menu (that unlike its namesake in a restaurant never goes away once a selection has been made). In the case of the blog format, readers have multiple opportunities to interact with the writer or other readers by giving feedback. Reading on screen is ever less a private matter and ever more a quasi-public event intermeshed with algorithms that track associated behaviors, including which document readers came from, where they go next, and all links, keywords, and lookups engaged in the meantime.

To say that such an upheaval in the nature of text and reading presents a challenge to educators and educational researchers is to state the obvious; however, the goal of this chapter is to argue that the challenge of modern text technologies is continuous with the reading challenge of the past, and that these technologies also present opportunities. In the final section I argue that research is crucial in determining the best ways of exploiting the opportunities.

2. The challenges

It is popularly assumed that reading on screens and reading comprehension are inversely correlated, with more of the former being the cause for less of the latter. A subgenre of worrisome assessments has sprung up to argue points like “The Internet is rotting your brain” (Miller, 2010) and “Google is making us stupid” (Carr, 2008). Carr’s *The Shallows* (2010) is a non-academic but still serious work expressing a growing unease about the kinds of mental experience that a fully linked docuverse leaves us with. The basic problem is that fully linked, mixed-quality, non-linear documents provide mainly distraction and overload rather than breadth of information, and far more of it than people can actually cope with. The problem is particularly pointed for those who little previous experience with ‘real’ (i.e. paper) texts such as children, now renamed ‘digital natives,’ or second language learners, who are meeting their new languages through digital texts.

How worried should we really be? The evidence Carr and his colleagues provide is mainly personal and anecdotal, but they may have a point. Research studies both broad and narrow are starting to look at the costs and benefits of hypertextual, lateral, or search-based reading (to name just a few of the terms competing to name the new reading). One broad empirical investigation is a five-year study by Rowlands and Nicholas (2008) of the computer logs from two heavily used UK research Web portals. They show that link-enabled researchers both young and old tend to skim rather than read, hop from one source to another, rarely return to any source they have already read, and rarely read more than two pages of any document. This is not so much reading deeply as ‘power browsing horizontally’ through abstracts and content pages in search of quick references for school assignments or research papers. Similar evidence from a different angle comes from the US-based Citation Project study of students’ academic writing which comments strongly on their reading: in a wide array of student submissions, 46% of citations were to the first page of the cited source and 77% to the first three pages. (Whether print reading was any different is, of course, a moot point, since there were fewer ways to track reading processes or products in the past.) It is not clear whether a similar picture prevails in leisure reading where, as mentioned, the number of downloads is substantial. Downloaded, but read? The ‘Netflix for books’ eBook site Oyster (acquired by Google in 2015) tracks reader behavior in order to pay publishers only for books its users ‘have read,’ considering this to be the case when 10% of the number of pages of a book has been clicked open. There is also evidence that reading on screens per se – regardless of access (or not) to hyperlinks and multimedia -- is problematic: Wästlund (2007) had 72 participants read the same five 1,000-word examination texts on paper vs. screen for 30 minutes to determine whether there was a difference in the physical and cognitive resources demanded by the two media configurations. The screen readers scored slightly but significantly lower on a comprehension test and reported higher levels of stress and fatigue.

Research by deStefano and Lefebvre (2007) provides a closer look at the processes involved in reading on screens. They synthesized results from 38 experimental studies of the cognitive consequences of hypertext reading in the early years of Internet penetration “in order to test the hypothesis that activities specific to hypertext can increase cognitive load and impair learning” (p. 1617). They asked whether, throughout this research, there was any indication that, “When people follow links, they may lose track of where they are in the text, of their reading goals, of the larger context for the node, or of

material activated in working memory” (p. 1627). The review of L1 reading studies concludes that generally, in the experiments reviewed, “many features of hypertext resulted in increased cognitive load and thus may have required working memory capacity that exceeded readers’ capabilities”(p. 1636). Since the capabilities of young and second language learners are limited, this finding confirms the challenges that such learners face. DeStefano and Lefebvre (2007) go on to observe that “the various manipulations [entailed in linked or hypertext reading] were often most detrimental to the reading processes of less-knowledgeable readers and for readers with low working memory capacity” compared to traditional linear presentations of text.

This research would seem to be quite relevant to reading researchers and instructors in early reading contexts, if a little underspecified for their purposes. As far as which particular parts of comprehension in particular might be a risk in hypertext environments, Maryanne Wolf, Director of the Center for Reading and Language Research at Tufts University, identifies “going beyond the text” (or “beyond the information given in Bruner’s, 1973, phrase) as what is most likely to be compromised in computer-presented multimedia hypertexts. In other words the ability to get into then back out of a text in order to see it critically. Wolf feels that a linked multimedia text engulfs the reader in ways that a paper text does not:

This unique aspect of reading has begun to trouble me considerably as I consider the Google universe of my children. Will the constructive component at the heart of reading begin to change and potentially atrophy as we shift to computer-presented text, in which massive amounts of information appear instantaneously? In other words, when seemingly complete visual information is given almost simultaneously, as it is in many digital presentations, is there either sufficient time or sufficient motivation to process the information more inferentially, analytically, and critically? Is the act of reading dramatically different in such contexts? The basic visual and linguistic processes might be identical, but would the more time-demanding, probative, analytical, and creative aspects of comprehension be foreshortened? Or does the potential added information from hyperlinked text contribute to the development of children’s thinking? Can we preserve the constructive nature of reading in our children alongside their growing abilities to perform multiple tasks and to integrate ever-expanding amounts of information? Should we begin to provide explicit instruction for reading multiple modalities of text presentation to ensure that our children learn multiple ways of processing information? I *stray* [emphasis added] with these questions... [2007, p. 16]

These are all live questions that have only become more urgent since 2007 when this was written. It is interesting that these ponderings are seen as ‘straying’ from the main issue at hand, which of course she sees as print literacy. Wolf’s intervention work (the ‘RAVE-O’ curriculum, <https://ase.tufts.edu/crlr/RAVE-O/>) is focused exclusively on print-based literacy with children and her worries about Google reading are not focused as research questions.

Is there any actual data showing that L2 learners are engulfed by multimedia digital texts as Wolf speculates? By reducing Wolf’s ‘creative knowledge construction’ down to ‘find the main idea of a text’ the present author was able to confirm that there is indeed an issue here. I have observed that all

beginning and most intermediate second language learners need training to cope with the clutter of extraneous information on an online dictionary page like the one shown in Fig 1. Note that less than 10% of the screen space is devoted to presenting the main information a learner would be visiting the page to obtain, which is the definition of *fiscal* (the red box minus the cut-out). The other 90% of the space is devoted to a sound file for *fiscal*, a *Visual Thesaurus* graphic of the word's semantic space (which is really an ad), two large for-real ads, links to at least 15 other Cambridge dictionaries, links for Facebook and Twitter, and of course links to the publisher's home page.



Fig 1. Finding the main information in an online learners' dictionary (entry for 'fiscal' in *Cambridge Advanced Learners' Dictionary*, accessed June 2012).

From intimations of difficulty with this relatively simple case of hypertext reading I pressed on to explore how learners cope with a longer hypertext, where there is presumably even more potential for main idea loss. I investigated two similar groups of 23 and 25 advanced ESL learners who were training to be non-native-speaking ESL teachers in Quebec (Cobb, 2012). All were 'very familiar' with multimedia experiences but not with this particular topic, and had read one of two versions of an account of Kenyan distance runner Sammy Wanjiru at the Chicago marathon in 2010. One group simply read the New Yorker summary of the main story on a computer screen (no links), while the other read the text linked a Youtube text plus a video rendition of the same story plus a small amount of complementary information. Following 25 minutes with these materials, each of the groups was given five minutes to write a point-form summary of Wanjiru's story. For those who had merely read the text on screen, none failed to arrive at the main point, which was that Wanjiru has taken his own life shortly after running the marathon. Of those who had experienced the linked multimedia version, 72% failed to include this key fact in their summaries. Instead, their summaries related minor details of either the film or text, despite the presence of "RIP" and "his last marathon" at the top of the Youtube (Fig. 2) and the fact that the tone of the story in either mode was building toward this tragically ironic conclusion throughout. So the worry about 'engulfment' and failure to go beyond the information given (or even pick up all the information given) may have some basis in the case of L2 learners.

Some simple explanations for this difference can be imagined, one being that more media may require more time to process. The explicit formulation of the main idea in the marathon text appears at the end – maybe some of the readers never got there. This raises the question of whether it is reasonable to apply the equal reading time model to comparisons of normal and hypertext L2 reading. Maybe they would have done better handling the two media separately rather than going back and forth in nonlinear fashion (if that is what they did)? It is odd, given the clear importance of the phenomena involved, that basic information about the reading of linked multimedia documents does not appear to have been sought let alone replicated and taxonomized into a usable knowledge base to share with L2 practitioners.

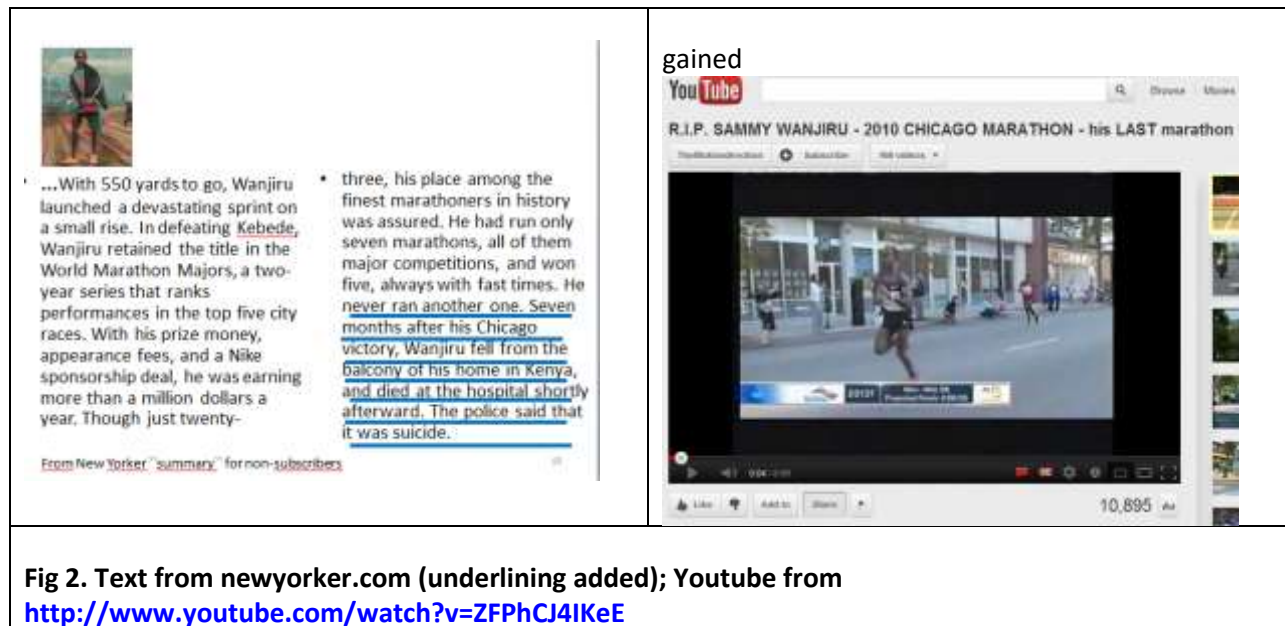


Fig 2. Text from newyorker.com (underlining added); Youtube from <http://www.youtube.com/watch?v=ZPhCJ4IKeE>

Proposals for the construction of such a knowledge base have not been lacking, and I have made them myself. In a study of acquiring new L2 vocabulary from reading with and without click-on lexical resources (Cobb, 2006), I found an 84% advantage for with-resources over print and dictionary reading. A similar study by Chun and Plass (1996) had found a 77% advantage for the with-resources group, and that this ostensible similarity would seem to augur well for integration of studies into a replicable knowledge base for the main features of hypertext L2 reading.

There is also relevant research from CALL (computer assisted language learning), which of course looks specifically at learning tools/environments rather than simply reading environments which is our focus here. Nonetheless, findings should be largely applicable; the body of work is sufficiently large to have been synthesized in successful meta-analyses. For instance, Taylor (2009) meta-analyzed results from 32 glossing studies to find an overall effect size of .92 (or just under one standard deviation) for comprehension of texts providing click-on glosses compared to similar texts providing glosses in print. Abraham (2008) presented findings from 11 glossing studies, finding a 'large' effect for vocabulary learning and a 'medium' effect on reading comprehension. These are optimistic findings about click-on glosses, but of course these are just one of many possible forms of hypertext and also they require

careful adaptation to the somewhat different context of natural online reading. Relevant variables to investigate include the types of media in the mix, information quality mix, and the placement of the glosses. Most important is how overall effects factor down to different types and levels of L2 learners. Some promising work on this has appeared in the moderating variables part of some of these syntheses, where for example Abraham (p. 209) found a strong effect size for intermediate learners (.88) and about half of that for beginners (.48).

Although this research has yet been adapted to the specific area of hypertext/multimedia reading outside of CALL environments, it clearly provides a useful model that L2 reading researchers interested in the question of reading on screens might usefully follow. But models from the realm of L1 research have become scarce. Since the flurry of studies cited above that date from the period 2005-2010, when digital reading was 'going online,' as it were, there is not much current evidence that researchers find these questions interesting or even researchable. Some simple online research shows how the topic has been dropped (maybe as digital reading is increasingly defined as reading *per se*). Google Scholar lists the many studies that have cited deStefano and Lefebvre's work in the eight years since it was published, but only a handful of these are in education or reading journals and none are in second language journals. Further, of those in education who do cite it, none tackle questions of costs and benefits of hypertext reading and for whom. For instance, a 2013 study by Mangen and colleagues begins with a citation from deStefano and Lefevre but does not deal with the 'for whom' question. They asked 72 tenth-grade students of similar (L1) reading ability in Norway to study one narrative and one expository text of 1,500 words on PDF files either on paper or on computer screens and then answer comprehension questions (having access to the texts). Students who had read on computers performed a little but significantly worse than students who read on paper, possibly because (it was observed) the screen readers could only see one screen at a time while those with paper could see several and therefore integrate their information more successfully (i.e. the documents were *not* true hypertexts with some menu or other way of getting non-linear access to other documents or parts of the same document). Further, this finding, while giving more evidence about the challenge of digital reading, does not deal at all with how different readers are affected. In both Scandinavian studies cited (this and Wästlund, 2007) the readers were of *similar* ability. But for beginning or second language readers, the interesting question is how these media affect readers of different abilities, and that research does not seem to be carried forward.

More recent works on 'literacy in the digital age' or words to this effect, as they appear in the 'Customers Also Bought' sidebar on www.amazon.com alongside the sample pages from Wolf's, 2007, *Proust and the Squid*, tend more to inspiration than research. They have titles like, *Why Libraries Matter More Than Ever in the Age of Google* (Palfrey, 2015) or *Tap, Click, Read* (Guernsey & Levine, 2015). A more academically oriented title is linguist Naomi Baron's (2015) review *Words Onscreen* which basically details the different yet complementary 'affordances' of print and screen. You can annotate a book more easily than a screen, so annotatability is one of its affordances; you can carry 15 books on a Kindle more easily than in a suitcase, so portability is one of its affordances. Baron presents a host of research findings similar to those already discussed assessing the general impact of technology on text, including the fascinating finding that '92 percent of college students [from 300 students in four countries] prefer

reading print books to e-readers.’ She explains the apparent inconsistency of this preference for print with the actual eBooks the students are downloading as basically a market squeeze. To understand the rise of e-Books, she suggests “start with the money trail” (p. 12), i.e. the high cost and low profitability of paper textbooks for publishers. Still, Baron concludes her analysis fairly optimistically with the idea that the uses of digital and print media will gradually sort themselves out. We have always read different types of texts in different ways for different purposes (a telephone book differently from a police report or Tolstoy novel) and dealing with a slightly more diverse range of media in the future will be no different.

But once again the specter of winners and losers is not raised, nor is any other learning-to-read-hypertext aspect that might have relevance to L2 contexts. Baron’s suggestion that reading will go on much as before does not take into account that print reading was already a problem for many before and seems headed to becoming a worse one in the future.

Everything that makes reading hard for some readers (both L1 and L2) makes it harder in linked multimedia formats. For example, an important problem with reading has always been distraction from outside the text, but now the distraction comes from right inside the text itself. Screen readers today are faced with a row of button-links along the sides and top, links to ‘resources,’ for every word in the body of the text and many with ads that jump to a different text, sometimes with no obvious way back. Even when the hyper-journey to a second text (say to a definition or biographical note) is benign, it involves holding and coordinating two or more information sources at the same time while remembering where one had got to in the main text. This taxes memory resources that are almost definitively inadequate in the case of young and second language learners. What prevents reading from becoming an impossible exercise in multitasking is automaticity and chunking of all the cognitive bits and pieces involved (nicely detailed in Gough’s, 1972, classic ‘One second of reading.’) Achieving this level of fluency to any significant degree in a second language requires a large amount of exposure to text -- on the order of 10,000 hours of low-stress, single-task reading -- and a recognition lexicon of at least 8,000 word families (Nation, 2006). Even then, assuming a text can be decoded by the L2 reader, the final goal of a critical assessment of its contents and their implications may well be difficult as Wolf surmises because of the ‘engulfing’ nature of many digital texts.

At the end of her ‘Google reading’ speculations, Wolf (2007, p. 7) speculatively wonders, “Should we begin to provide explicit instruction for reading multiple modalities of text presentation...?” In the context of deStefano and other research the answer seems an obvious Yes. Learning to read is not free, it takes effort, and all indications are that reading in a digital environment while bringing benefits for strong readers takes even more effort for weak.

2a. Teaching to the challenge

What would training wheels for happy travel in the interlinked docuverse look like? A number of books are now available with usable teaching ideas, although most seem not to be based on evidence about where problems may lie and none seem devoted to second language learners. That said, Guernsey and Levine’s (2015) *Tap, Click, Read* offers several usable ideas for younger first language readers, and the

author's reading resource page on the website Lextutor (www.lex tutor.ca) is designed to support L2 reading on screens via experimental interfaces. A concrete issue that the site has tackled is the problem of linked texts where the first typically disappears behind the second making it difficult to integrate information from the both texts; the reader must hold the first in memory (or else return to it and then hold the second in memory). A common case in point is the native Apple smart phone tap-word dictionary feature, in which the dictionary requires two separate actions (tap to select and then choose 'define') to produce its meaning and then displaces the first text taking up the whole screen. Figure 3 shows this operation on iPhone 6 using a medium-difficulty story by Margaret Wentle from the Toronto Globe and Mail of 9 April 2016. The story is about sexual assault on North American campuses, and the reader is stuck on the word 'dull.' The reader taps on the word (which may often involve technical hitches), dictionary entries from three sources appear on the screen and displace the text; the reader must then return to the text when finished consulting.

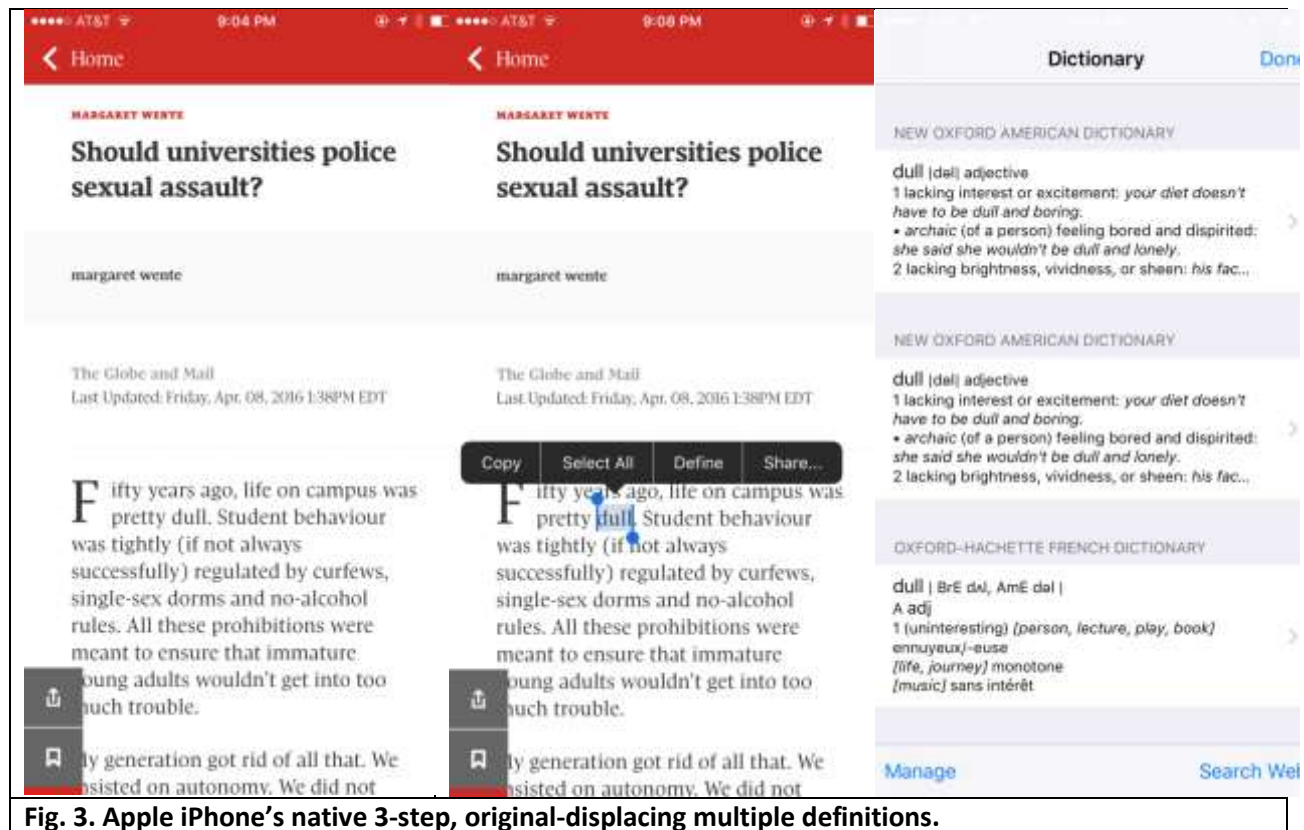


Fig. 3. Apple iPhone's native 3-step, original-displacing multiple definitions.

An experienced user of English can probably use this information to effect, owing to capacious memory resources provided by a lifetime of automaticity practice, but for an L2 reader for whom this is a true learning text (i.e. pushing the skill repertoire) the displacement of the text almost certainly makes it challenging to integrate the definition with the way *dull* is used in this particular context. Admittedly the looked-up word remains conveniently highlighted on return from the definition, but even so, the integration of meaning and context must take place mainly in memory since they do not appear

together. Had there been other media involved in this maneuver (such as a video or sound recording related to the text) the original text could be buried three layers deep.

Compare Figure 3 to Figure 4 which illustrates a learner-oriented version of the same operation. The features to note are the several interrelated screens in fixed positions; the definition is produced in a single click, and importantly the definition and contextualization of the target word can be examined simultaneously. The integration of the two types of information is facilitated by the clicked word remaining highlighted after the definition has been produced on the right screen. An accompanying video and soundtrack are also available, which can also be accessed without losing view of the main text.

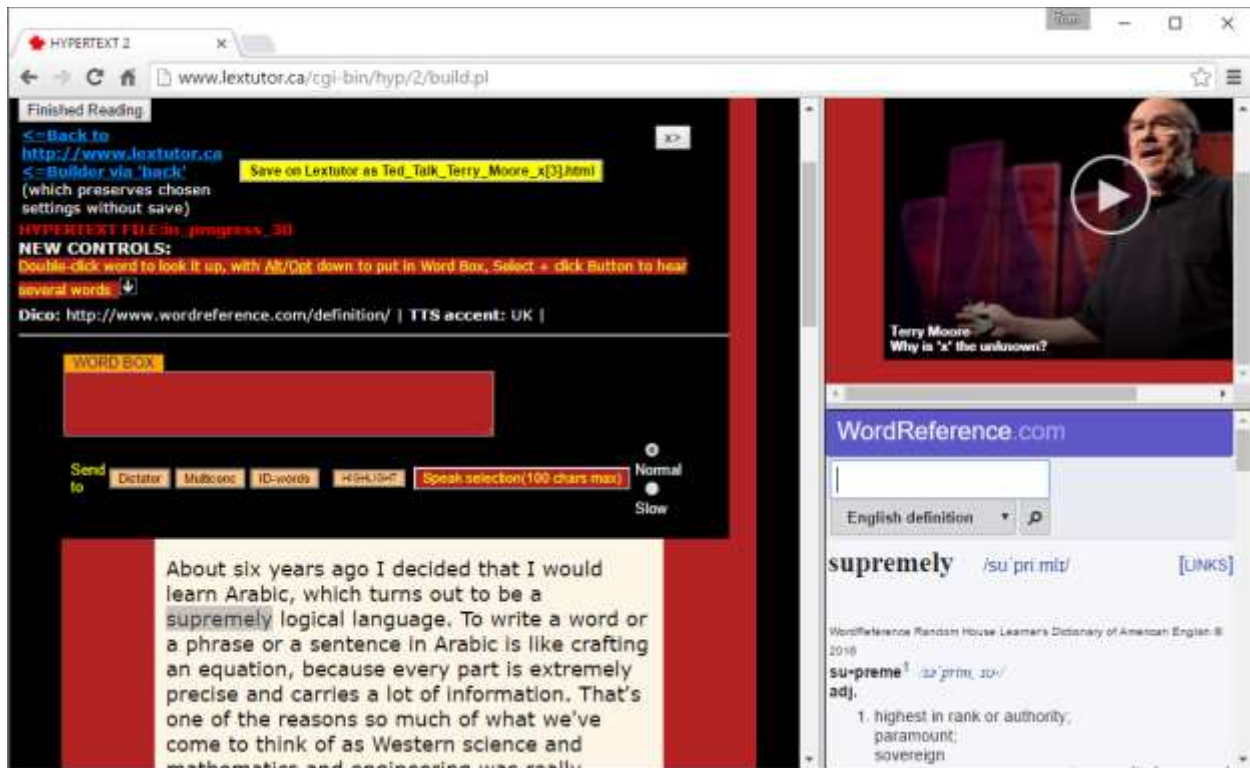


Fig 4. Learner-friendly look-up and media integration from Ted Talk by Terry Moore (*Why is 'x' the unknown?*) and wordreference.com 'mini' dictionary (from <http://www.lexutor.ca/hyp/2/>)

Further examples could be furnished, but suffice it to say that all or most characteristics of hypertext/multimedia reading that have been pared down for small screens and native speaker skill can be spread back out and made learner friendly without losing the main benefit. The assumption of course is that working with Figure 4 would be some sort of preparation for Figure 3. The nature of the linguistic and cognitive resources needed to make the transition is an empirical and highly researchable question. This is a point I will explore in more detail in the final section. The next section returns to the point that hypertext reading is not so much something new but rather a continuation of something old.

3. The continuities of new and old reading

The challenges posed by recent text technologies may appear to be a radical departure from those of 'normal' reading but in fact they are continuous. They are merely the latest and certainly not the last step in the 'technologizing of the word' (Ong, 1982) that began when languages came to be written down. Written texts and the producing or interpreting of such texts are and have always been instances of interacting with a technology. This is true whether we think of technology as a quasi-industrial process involving particular tools and procedures (quill pen, printing press, keyboard) or in the broader sense of artifice involving arbitrary representations and extended learning curves.

Everyone gets spoken language for free, but written language comes at a cost. The variance in comprehension of a radio news broadcast is minor and can be traced to cognitive and knowledge factors unrelated to code handling; for the same news written down, the variance is significant and ability to decode makes a difference. This is because written language is not part of our biological inheritance, but rather an arbitrary code that must be learned. It is at several removes from both the familiar world around us and the spoken language we use to describe it.

Speaking and listening are universal acquisitions, which everyone in a social environment who is not disabled masters at roughly the same pace and to a similar level; but writing and reading are "unnatural acts" (so named by Gough & Hillinger, 1980) that are acquired unevenly, uncertainly, and with variability of outcome. Variants of the phrase are DeHaene's (2009) "Writing is a human invention" (from his subtitle) that borrows abilities developed for other purposes through neuronal recycling, or Wolf's (2007, p.3) "We were never born to read". All people of normal intelligence learn the spoken version of their first languages to the extent needed to function in their typical environments; the same cannot be said for writing and reading. An analogy is learning to swim: everyone learns to walk with no or minor assistance; learning to swim takes effort and instruction and yields variable outcomes. And swimming functions by borrowing body parts that were adapted for other purposes (the arms and legs), which is exactly how DeHaene describes the reading process (perceptual abilities in the eyes and cortex originally designed for food identification).

The representations involved in writing are not only abstract and arbitrary but became ever more so with each step in its evolution. Writing systems began in ideographs or quasi-pictorial notation (𐌲 = ba = cow horns = bacar/vache) but gradually gave way to combinations of pictures in hieroglyphs. Such combinations were used first to capture hard-to-picture concepts with other pictures (mouth + bread = eat) and then to capture the *sound* of a hard-to-picture concepts with pictures (as in the hypothetical example *cell + fish = selfish*). The focus on sound rather than sight was complete when symbols represented not things but pieces of the speech stream, first the comparatively concrete unit of consonant-based syllables (as in Arabic, where ك ت ب = كتب = ka-ta-ba represents the sounds meaning 'he wrote') and finally fully abstract individual sounds with representations for both vowels and consonants (d-o-g=dog). The point that the system is arbitrary is also evident in the fact that the spoken form for the barking pet can just as logically be spelled *dawg*. With every additional step away from the visible world, writing became capable of representing a greater number and complexity of concepts and

was ultimately more useful as means of storing and conveying information about the very world it had departed from – but at the cost that it took longer to learn and some users never really learned it.

One reason that some users of a language never really learn its writing system is the abstract nature of the code, and the other is the overwhelmingly large size of the lexicons that this abstraction makes possible. Before languages were fully written, it seems likely they comprised about the number of words that a typical adult of any time period would be likely to know, which is about 15,000-20,000 word families. But with a fully developed written language, lexicons were free to proliferate in size and complexity since they did not need to be held in any one person's memory. The lexicons of modern languages are truly enormous, comprising 2 million lexemes in the case of English, which of course are not fully known to everyone or even anyone; they are used in texts in numbers that go beyond what can be learned from experience and oral interaction. Spoken language uses about 3,000 word families to express its meanings, supplemented by shared context, face and body language, and of course clarification opportunities; the other 15,000 families in relatively common use appear almost exclusively in texts (or in discussions of texts such as takes place in university seminars). These ideas are more fully developed in Cobb (2013).

By the time formal education begins, and with it learning to read, children know roughly 5,000 word families. Spoken language production and processing are fully automatized and chunked (meaning that predictable sequences of sounds, word classes, and collocations are processed as single units, leaving working memory free to interpret intent and meaning). This means that further learning (vocabulary, pronunciation, style variation) can be assimilated within existing structures. But the same is not normally true for reading. Even precocious Grade 1 readers recognize in writing only a small proportion of the words they know in speech. Not only does reading involve a lot of new knowledge but also new ways of acquiring this knowledge. Speech is learned in a rich, contextually dense environment with many, many extra-textual and even extra-linguistic clues as to the meaning of what is being said or taking place. Text processing has far fewer cues, and these are mainly confined to within the text itself – and guesses about what things mean must be made without (immediate) feedback.

An attested phenomenon in reading development is the strong risk of a 'fourth grade slump' (Chall & Jacobs, 2003) as children make the necessary move from 'learning to read' to 'reading to learn.' Up to then reading development has mainly involved attaching written labels to words already known in speech – the concepts are largely in place. But at about Grade 4, children are required to cope more and more with new words and new concepts that appear mainly in texts (technical, analytic, unfamiliar, infrequent). These will largely be learned from cues within texts themselves (although with varying amounts of support from whatever type of instruction they are in).

The slump idea applies to native speakers, but there is a second-language version of the same phenomenon, not necessarily at Grade 4 but at a time relative to the age at which schooling in the second language began. Cummins (e.g., 1991) has detailed the extent to which children and adolescents being schooled in a second language are likely to pick up the language of conversation and personal interaction to an adequate degree (contextualized, with immediate feedback, etc.). Yet then, like Chall's fourth graders, they tend to slump as they attempt to achieve 'cognitive academic language proficiency'

(CALP in Cummins' term) with its reduced contexts, augmented conceptual complexity, and greater dependence on instruction and effort. To this general picture Cummins adds evidence that in the case of older second language learners, there may be also be a risk of failure to transfer reading ability already acquired in the first language if L2 resources (mainly vocabulary) are insufficiently developed.

In summary then, if the 'new reading' requires deliberate instruction to realize the full benefits of text technologies and avoid the pitfalls suggested by deStefano and Lefevre, this should be no surprise since the old reading required it too. Suffice it to say that not everybody gets the instruction or guided practice they need in print reading. Maybe we can do better with 'Literacy Part 2,' as hypertext literacy has been called.

4. The opportunities

Like most writing about hypertext literacy, this piece has dwelled mainly on its real or supposed negatives. (It is easier to complain than to adapt one's teaching to real costs and benefits.) In fact the potential advantages are considerable. Every negative mentioned so far has a large potential positive. For example the notorious process of tracking Internet users for targeted advertising can also be used to answer ancient riddles about learning to read, allowing researchers to dig into the processes of reading rather than simply the products. Again: students may prefer print to digital, but along with digital text has come a vast multiplication of the amount and quality of text available and the ease with which it can be obtained and shared. Once I would have spent a week in the library finding and photocopying materials for a piece such as this one, but now have been able to devote most of that time to thinking and writing. In terms of more specific benefits, and given space constraints, I will focus on one or two ways that linked hypertexts may be able to solve some old reading problems raised in earlier sections.

One simple but serious problem in adult second language reading is that readers pause so often to look up or write down words that there is little chance of their forming a coherent representation of the text as a whole (or, getting the main idea). A simple solution to this is to allow learners a quick in-context look-up as shown in Figure 4, with minimal departure from the text. Another solution is to allow learners to collect the interesting words in a text as they read for *later* look up. In Figure 5, again an illustration of a resource available at the author's reading website, the French *affrontements* got a look up, but other words of interest were saved for later in the Word Box with an Alt-Click involving minimal departure from the text - and the whole sent to the teacher for incorporation in future reading and vocabulary work.



Fig 5. Looking up *affrontement* but saving *emissaires* and *crise* for confirmation later - in a news report and sound file in *Français Facile* on Jan. 1, 2011, from *Radio France Internationale (RFI)*, at <http://savoirs.rfi.fr/fr/apprendre-enseigner/langue-francaise/journal-en-francais-facile>

A more complex reading problem, as already discussed, is that as learning to read evolves into reading to learn, the vocabulary involved becomes less familiar. First and second language readers alike are likely to encounter the written forms of frequent words like *street* and *shop* often and in supportive contexts (e.g. on signs and in predictable stories). This is far less likely to so in the case of 'school' words like *determine*, *consequence*, and *inhibit*. Reference points for meanings are likely to be fewer and the informativeness of the contexts in which they appear is likely to be reduced, as discussed above in reference to work by Chall in first language and Cummins in second. Carefully designed hypertexts should be able to help deal with this problem by augmenting the context of the text. A rudimentary example of augmented contextualization is shown in Fig. 6, where in addition to getting a definition the reader of de Maupassant's *Boule de Suif* (1880) can also see which other chapter (*chapitre*) of the same story contains further instances of any word; which of the author's other works (*autres contes*) contains further instances; and in addition consult a backgrounder on the Franco-Prussian War of 1870, the story's setting. This approach is further discussed in Cobb (2006) under the title "delivering the teacher with the text."

Clearly the contextual support integrated into the *Boule de Suif* hypertext is just a basic example in one topic area. Science texts with interactive graphs, diagrams, translations, and elaborations in the margins linked to specific parts of the text are imaginable and to some extent already in existence, although probably not widely and certainly without sufficient research into their effectiveness or most effective uses. Such contextualization clearly has to be done carefully and to a plan, since as suggested by Wolf

(and demonstrated in the marathon runner experiment), merely engulfing readers in contextual information may impede rather than enhance comprehension.

Accueil > RA-Reading > Boule de Suif (1880) Alt-Click words to hear and put info

- Guy de Maupassant - Dominique Dagulier Reset Wordbox > highlight >

CONTENU

- Chapitre 1
- Chapitre 2
- Chapitre 3
- Chapitre 4
- Chapitre 5

La guerre franco-allemande de 1870

boule3 >>> Double-cliquer les mots pour info

Dictionnaire concordances

Boule de suif, 3.

Des petits points de feu parurent en avant sur la route. C'était Tôtes. On avait marché onze heures, ce qui, avec les deux heures de repos laissées en quatre fois aux chevaux pour manger l'avoine et souffler, faisait quatorze. On entra dans le bourg, et devant l'hôtel du Commerce on s'arrêta.

La portière s'ouvrit. Un bruit bien connu fit tressaillir tous les voyageurs: c'étaient les heurts d'un fourreau de sabre sur le sol. Aussitôt la voix d'un Allemand cria quelque chose.

Bien que la diligence fût immobile, personne ne descendait, comme si l'on se fût attendu à être massacré à la sortie. Alors le conducteur apparut, tenant à la main une de ses lanternes, qui éclaira subitement jusqu'au fond de la voiture les deux rangs de têtes effarées, dont les bouches étaient ouvertes et les yeux écarquillés de surprise et d'épouvante.

A côté du cocher se tenait, en pleine lumière, un officier allemand, un grand jeune homme excessivement mince et blond, serré dans son uniforme comme une fille en son corset, et portant sur le côté sa casquette plate et cirée qui le faisait ressembler au chasseur d'un hôtel anglais. Sa

2 sur 5 chapitres contiennent repos Voir repos dans d'autres contes de Maupassant DICO repos

1. boulesuif_1.txt
[1] t et le fouet gigantesque du cocher claquait sans REPOS, voltigeait de tous les côtés, se nouant et se dé
2. boulesuif_3.txt
[1] rché onze heures, ce qui, avec les deux heures de REPOS laissées en quatre fois aux chevaux pour manger l

Fig 6. A French text commonly found in courses by de Maupassant (1880) with five kinds of supporting (or distracting?) context: sound, definition, other occurrences in the same text, other occurrences by same author, and historical background.

Perhaps the supreme example of contextualization of a text involves the practice of inviting readers to comment on a text which then becomes part of the text for subsequent readers (as in the discussion forum linked to a dictionary look-up in Fig. 7, where the boundary between text and talk almost disappears).

www.wordreference.com/definition/serendipity

WordReference.com

English definition

serendipity **seren**·dip·i·ty **UK-YO** /,sɛrənˈdɪpɪti/ [LINKS]

'dɪpɪti/

@ One or more forum threads is an exact match of your searched term. Click here.

WordReference Random House Learner's Dictionary of American English © 2018

seren·dip·i·ty /,serənˈdɪpɪti/

n. [uncountable]

1. an ability for making desirable discoveries by accident.
2. good fortune; luck.

seren·dip·i·tous, adj.:

a serendipitous discovery.

WordReference Random House Unabridged Dictionary of American English © 2018

seren·dip·i·ty (ser'ən dip'i tē).

n.

1. an aptitude for making desirable discoveries by accident.
2. good fortune; luck: the serendipity of getting the first job she applied for.

XII
New Member
Madrid/Barcelona/London/Manchester
English (GB)

Serendipity is pronounced /serən'dɪpɪti/

XII, Jan 21, 2011 85

wolfbmt
Senior Member
Poland
Polish

panjandrum said: ... and listen. Audrey's UK English version is close to mine.

Also it's worth noting that serendipity was coined by the English author Horace Walpole and is related to "The Three Princes of Serendip", the heroes of which were always making discoveries, by accidents and sagacity, of things they were not in quest of".
Source: <http://serendip.brynmawr.edu/serendip/about.html>
Actually I can say that I have discovered the origin of this word by serendipity. 😊

Fig 7. The entry for *serendipity* on wordreference.com starts by steering readers to the Forum, where learners from UK and Poland share information about its pronunciation and origin.

How and how much context can be included without engulfing readers and making them miss their main ideas is of course a researchable question.

5. The research questions

The foregoing discussion has made or insinuated a number of claims about linked hypertext reading that deserve research investigation – first in the form of small, specific question-based research and then as meta-analysis to pull it (always provisionally) together. The goal as mentioned is to create a usable knowledge base.

1. Can the deStefano and Lefebvre's (2007) finding of differential effects of hypertext reading for strong and weak learners be replicated in practical language learning contexts?
2. Is successful print reading a precondition for successful hyper-reading, and if so how much?
3. Should hyper-reading be specifically taught and practiced, or can it be fully mastered from a print base?
4. Do hypertext 'training wheels' in fact prepare readers for digital competence or is their time better spent simply reading more print materials?

5. In what conditions and at what learning stages is the amplified context made possible by digital text a help or a hindrance?
6. Can or should school examinations include a digital reading component?
7. Should teacher training include strategies to help learners become competent digital readers?

6. Conclusion

To answer the question implicit in my subtitle, what's new is that reading in a multimedia, hyperlinked, mixed quality environment is poised between benefits and challenges. What's old is that reading has always been this way although now in a particularly urgent way.

Pervasive digital text with all its problems and possibilities is upon us whether we like it or not. It is a transformation probably driven more by cost and financial opportunity than intellectual adventure and novel ways of communicating. Despite that, the benefits probably outweigh the costs, if for nothing more than the access, portability and transferability of digital text. Yet the linking and multimedia aspects are important too. What academic could imagine not having multiple documents open on a screen, or not being able to search through them all at once? Who has not read a news story and found the accompanying video pulled the story together in a way that text alone had not done and maybe could not do?

Print text will not go away, any more than speech went away after the invention of writing. Again the two media or modalities will find their best affordances. Certainly there will always be reasons to read *War and Peace* on paper (sentiment, absence of distraction, margin scribbling). Probably legal judgments, engineering reports or roadway proposals will never be other than dull looking paper tomes. On second thought, since the latter two already incorporate drawing and photographs, they probably have a place for embedded video; all three involve cross-references, so there is probably no reason these could not be hyperlinked...

For some constituencies print media has already gone away. This does not mean that anyone enrolled in the education system should not be introduced to paper text and its effective handling, as this sort of reading will play some role for the foreseeable future and even may be the precondition to successful hypertext engagement. In any case, print literacy is unlikely to come under threat in the education system any time soon. On the contrary, many educators are likely to continue dealing with print reading as if it were the only kind of reading and ignore digital reading as an object of instruction, because of conservatism in the teaching/testing ranks and the association of digital reading with entertainment. But failure to provide instruction in best use of digital text is a mistake.

The research takeaway from this chapter is deStefano and Levefre's (2007) meta-finding is that "the various manipulations [entailed in linked or hypertext reading] were often most detrimental to the reading processes of less-knowledgeable readers and for readers with low working memory capacity." If reading is not just learned by all like speech but needs to be taught, then it is a plausible extension that

digital reading also needs to be taught, and probably more so. Whether and how well this will happen is probably predictable from how well it has happened for print literacy.

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