

# What do students need to know to achieve ICT fluency?

Paul Horwitz

The Concord Consortium

## Is nothing new under the sun?

Imagine that the year is 1500. The printing press is 50 years old, about as old as the computer is today. Cheap, printed books, mostly from Venice, are beginning to flow across Europe. As a result, new demands are being placed on education: suddenly it has become important for ordinary people, not just those who will enter the clergy or the law, to be able to read. And reading, it is becoming clear, in contrast to other useful skills like blacksmithing or shoemaking, cannot be learned by apprenticeship – it requires a special kind of place called a “school.” So formal education is becoming a requirement for a growing middle class<sup>1</sup>.

Will the computer have the same kind of far-reaching effect on education that the printing press had 500 years ago? Are there things that students today need to know that they don't learn in the traditional school environment? If so, what are those things, and what should we be doing to ensure that they are taught and learned?

Superficially, one can imagine that the computer raises no educational issues not covered already by books and other media. After all, we already teach our children how to read. What difference can it possibly make whether the words are on a horizontal surface or a vertical one? And as for so-called “multimedia” – movies have been around for over a century, still pictures since the caveman. Do we really care what kind of screen we view them on?

But it's not that simple. The Web is not a book, neither is it a library, an art gallery, or a movie theater. And reading on a computer is fundamentally different from reading a book, or a newspaper, or a scholarly article. On a computer, text tends to come in small snippets (for some reason, no one wants to read much more than one screen at a time) connected to each other by hyperlinks created by the author. Sometimes the semantics behind those links is obvious, sometimes it is obscure – and sometimes the link leads to a different website altogether which may have been created for a slightly different purpose and audience. To “read” a computer, students need to learn how to follow hypertext links without getting lost or forgetting what their original intent was; they need to master a certain form of nonlinear thinking.

The plethora of unfiltered information available on the Web also places increased emphasis on students' ability to evaluate that information, to identify disinformation and propaganda when it occurs, to check sources for consistency and coherence. In one of the more useful neologisms of this Age of the Search Engine, our students need to learn how to Google. This involves much more than typing a key word or phrase and then browsing

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<sup>1</sup> For an in-depth look at the societal effects of the printing press, including its effects on education, see Eisenstein, E. (1979). The Printing Press as an Agent of Change. Cambridge, UK, Cambridge University Press.

the first ten thousandth of one percent of the resulting hits. Students must learn how to make sense of all that information, how to place it in context, subsume it with their existing knowledge, run it past an internal censor before accepting it.

There is an interesting parallel, actually, between the invention of printing and the appearance of the modern search engine. Even as printed books increased the importance of reading, they were devaluing another, more ancient, skill: that of memorization. Today, we find it remarkable that before the 16<sup>th</sup> Century so many educated people were able to memorize the Bible or the complete works of Cicero. The “literature” of authors such as Homer depended on such prodigious feats of memory, the art of which has now been abandoned in favor of techniques for rapidly locating information in books. By automating the search process and making it vastly more powerful, Google is making such “librarian skills” obsolete while simultaneously raising concerns about what new knowledge students will need if they are to manage their new-found powers wisely.

### **Why should ICT fluency be restricted to *language*?**

Powerful though those applications are, to consider the computer as nothing more than a replacement for books and other media is to vastly underestimate its potential effect on education. Computers can do much more than communicate, whether in text or multimedia. They are tools that can do many things, and to be “ICT fluent” should entail knowing what those things are, being able to get computers to do them, and understanding their utility, their potential misuses, and their limitations. Here are two examples:

Computers can implement and run numerical models of naturally occurring phenomena, and indeed their use in this capacity has revolutionized many areas of science, mathematics, and engineering. Accordingly, whether or not they intend to enter these fields, 21<sup>st</sup> Century students should know something about how computers are used for modeling everything from global climate change to the behavior of airfoils. They do not need to know how to build such models, or even how to use them, but they should know that they exist, how they are used, and what their limitations are.

Computers are routinely used to store and provide access to a great deal of personal information about individuals. Often this information is collected in quite informal ways – for example, personal networking websites like Friendsters (<http://www.friendster.com>) generally request that new members fill out questionnaires. Although this action is undertaken entirely voluntarily, and notwithstanding the posting of explicit privacy policies by the websites, students are often unaware of the potentially damaging consequences of posting personal information on the Web where it may remain accessible for a very long time. ICT fluency should include awareness of the potential dangers of the misuse of databases.

### **Should kids become ICT fluent in school?**

Although this meeting and the report that will emerge from it are primarily interested in the role that formal and informal educational institutions can play in helping youngsters become fluent in ICT, it is important to recognize that the process is going on apace every day, largely outside those adult-ridden environments. The rise of massive multiplayer online role playing games (MMORPGs) – Everquest claimed more than 375,000 active players in 2003, World of Warcraft probably has many more – is a social

phenomenon of immense proportions and unpredictable potential, affecting young people disproportionately (the mean age of Starcraft players is 18.3)<sup>i</sup> . Cellphones are rapidly becoming computers (or is it the other way around?) that kids learn about and, for the most part, use outside the classroom. Should ICT fluency encompass these and other emerging technologies? If so, should fluency with them be the subject of school-based curricula?

Though I would answer “yes” to the first question, my tendency is to say “no” to the second in most cases. Every sufficiently powerful new technology brings new challenges and opportunities; that doesn’t mean that every such technology should be taught in school. The automobile, for instance, is certainly a powerful, ubiquitous, and potentially dangerous technology, but although “driver’s ed” courses are taught in many schools, they are hardly considered part of the core curriculum. They are offered on the school premises as a convenience, not because “mastery” of the automobile is seen as an important goal of education. If kids become fluent in ICT largely outside of school, that is probably a desirable, as much as inevitable, outcome.

Having said that, however, I return to a thought that I visited above: I have the feeling (though I have no statistics to back up this up) that people – youngsters and adults alike – have a tendency to trust computers much too much, and then to be unduly critical when the models lead them astray. A weather model is not, and never can be, 100% accurate, nevertheless weather predictions based on computer models are more reliable than horoscopes (which may well be generated by computers, for all I know). To the extent that an ever-increasing percentage of what we believe to be true is based on computer models, we need to be sophisticated in our assessment of the value and reliability of those beliefs. To instill that sophistication should be a primary goal of 21st Century schools.

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<sup>i</sup> <http://www.nickyee.com/eqt/demographics.html>