Journal of Information Fluency

Jif

Getting information off the Internet is like taking a drink from a fire hydrant.

Mitchell Kapor

iCloud™; You Cloud; He, She and It Cloud

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When I was much younger and started my tentative, first forays into the world of information gathering, I would walk into the library and up to what I thought was an overwhelming wall of wooden drawers. I would cup my fingers under the drawer pulls and pull open the world of information where everything was neatly packaged—even the "key words" I needed to help me find information were there on tabbed cards—Abraham Lincoln, and his childhood in Illinois, and his early years as a state senator, and his campaign, and his family, and his presidency, and the civil war, even Mary Todd—all carefully organized for me. The bad news was that I had only these topics to choose among, but that was also the good news.

All the information in the world—or at least the information that I had access to—was pre-vetted, scholarly because it came from a library whose classical architecture gave the assurance of great knowledge, and solid, carefully packaged inside books. At first I just had to accept, to drink in all that was there, savor the headiness of it; later I learned to read more carefully between the lines, to understand how metaphors and images create ideas and understandings, but honestly, I didn't have to think critically in the ways that I do now—certainly not in the ways that I expect our students to think fresh from the womb of high school. Now they have the clouds to search through.

As a metaphor "the cloud" stirs up all kinds of images of exploration and discovery, promising a wealth of knowledge beyond imagining, Aladdin on his carpet soaring through white cotton wisps. I'm surprised that Disney, Inc. didn't think of it first. It was almost disappointing to find that "the cloud" consists of large warehouses outside of Baltimore and Pittsburgh and several other cities. However, as a metaphor, "the cloud" is apt in that it readily describes the current nature of information: clouds dissipate, change shape, evaporate, turn dark and gray, rain down, float in jet streams, changing their positions at the whim of nature.

We now lead lives that are technology rich and information-filled. We walk through a world that is full of textual, visual, and tactile information, always have at least one ear bud in, a cell phone ready for any up to the millisecond sound bite of gossip from friends and family or information from news sources—always already plugged into our technological grapevines. We do all of this without going anywhere except "the cloud."

We lead technology mediated lives where every moment is a learning moment—probably outside of our professional lives and inside cyberspace more than inside of traditional workspaces or classrooms.

Educational institutions have kept control over learning , making decisions about what constitutes knowledge and about what knowledge is valuable, useful and ethical. On the one hand, this gate-keeping mechanism has often caused a fear of or skepticism about new technologies or new ways of using old technologies because it interferes with our traditional processes of collecting, evaluating, and using information so we can construct knowledge in controllable, manageable texts.

On the other hand, the cloud is breaking up the control of knowledge; almost everyone with the financial means has access, has been rained on and soaked in technology. Users know how to collect and put together information in ways that are in the very least widely creative, absolutely fascinating in a post-structural kind of pastiche, but often lack the meta-texting, the thinking about thinking or more to the point the critical thinking about context: how we've gathered this information, now that we know this what do we really know? And how do we use information to shape the context—our culture—in meaningful, socially beneficial, and ethical ways.

And as we head to the clouds, and explore this new world of information, what kinds of questions should we

be asking? Say about Tagging—are there a limited number of tags, or can we create our own? What is the breadth of indexing in Google, flickr, YouTube, and delicious? Is what your peers find important and valuable always useful or relevant to your learning and research? Is a professional blog as sacrosanct as an academic, peer-reviewed journal? How do you evaluate and then ethically and legally use others' content? If we want to encourage user generated tags, how do we work without a common language so that when a student uses the term "article" as in "I found an article about nanobots" we both mean the same thing? How important is process literacy? How much of the process behind the technology should the average user know? Is access only about hardware and the necessary skill level to enter the Web? Or does a certain mind-set or affect preclude full access in on-line civil discourse no matter how high the level of technological skill?

As you read our first issue of the Journal of Information Fluency, you will probably find yourself asking even more questions. Karen Swan, University of Illinois Springfield, explores how information technologies are changing the ways we think about communication, literacy, and possibly, changing our cognitive processes as well. Gavin Sanderson, University of South Australia, tackles the discussion of the globalization of information gathering practices and technologies. In "The 'Write' Context: Embedding Information Literacy," Jonathan Alexander, Cathy Palmer and Kevin Ruminson, University of California, Irvine, conducted research to explore how students learn to work with information and develop "source integration" in their writing.

The issues raised in these articles—information literacy and globalization, expanding definitions of literacy, studying student search strategies—are all topics worthy of discussion. We hope that you will consider joining the conversation as these scholars have by sending us your own work. Our plan is for two issues each year— fall and spring—which will contain five or six articles, letters, notes, and short articles from graduate students. Depending on the results of next year's conference—Information Fluency and the Digital Divides, March 14-16, 2012 at the University of Central Florida, Orlando—we will publish a special issue of conference proceedings.

For Conference Information
www.ce.ucf.edu/if
Information Fluency & The Digital Divides
March 14-16, 2012
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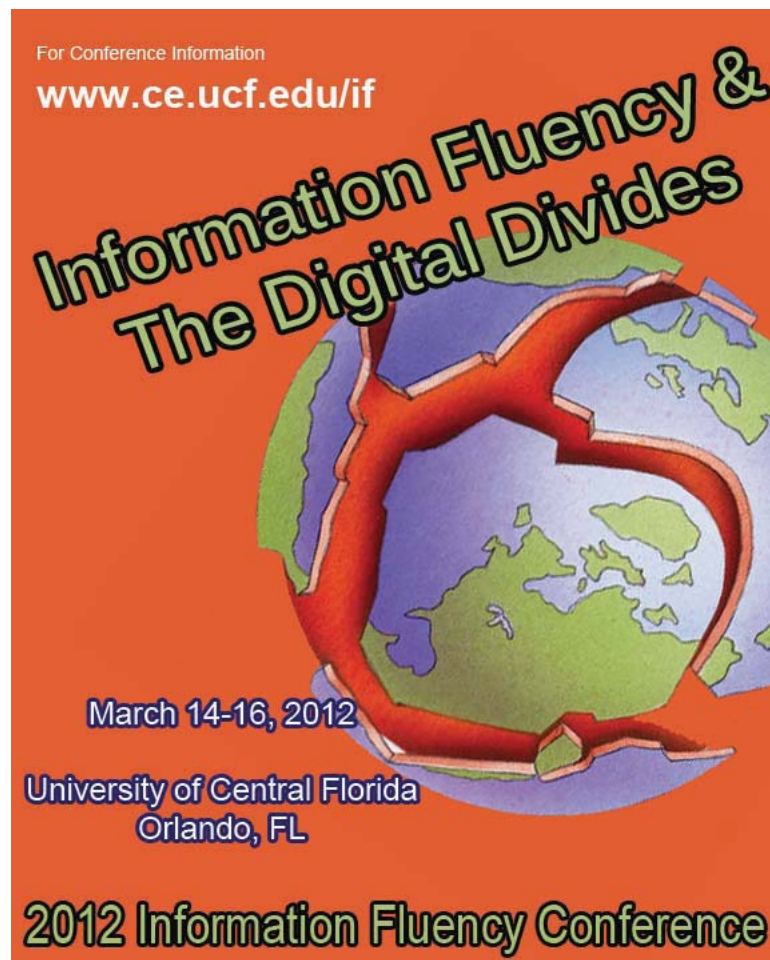
Technology and Information Literacy

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"We shape our tools and they in turn shape us."
Marshall McLuhan

All technologies are selective. They facilitate, amplify, and enhance particular ways of knowing, while inhibiting, marginalizing, and sometimes even excluding others (Gibson, 1977; McLuhan, 1964). This is as true of communication technologies and cognitive processes as it is of mechanical technologies and physical processes. And therein lies the link between technology and literacy. We are witnessing today the emergence of a variety of digital technologies which are displacing print technologies as the dominant media of our culture. This digital revolution is not only changing the way we communicate, but also, I will argue, may be changing the way we think. It is clearly changing what it means to be literate in ways both obvious and subtle.

Technology

While we often think of the word technology as somehow referring to machines, its actual meaning is broader. Collins English Dictionary (2009), for example, defines technology as "the application of practical sciences to industry or commerce; and the methods, theory, and practices governing such application." Wikipedia (2011) defines technology as the "knowledge of tools, techniques, crafts, systems or methods of organization in order to solve a problem or serve some purpose." Lewis Mumford (1934) used the term technics instead of technology to foreground his belief that the technologies of any particular place and time are the result of an interplay between the social milieu and technological innovation. Henry Jenkins (2006) holds a similar view, maintaining that media are characterized not only by the technologies they employ, but by the cultural practices that surround their use.

Two aspects of these shared definitions are important to note. First, they all center on the systematic application of knowledge to practical purposes, not on machines. Instructional technologies, for example, involve the systematic application of our scientific understanding of learning to the practical problems of teaching. They do not necessarily include the use of any devices at all. Second, the definitions place technologies in a larger social, historical, and cultural context that influences, and, in turn, is influenced by their use. Mechanical clocks, for example, were invented by Medieval monks as a way of marking the hours for their devotions. Their invention, however, forever changed the ways in which we perceive time.

Although my use of the word technology in this essay will often be rooted in the use of digital devices, it will be important to understand such use as being grounded in systematic representations of knowledge that are shared across particular devices and framed by social and cultural practices. Thus, the seemingly ubiquitous digital technologies of today are much more than communications devices. They embody new ways of constructing knowledge and their use is driving new social and cultural practices.

Literacy

The primary meaning of literacy is the ability to read and write (Random House Dictionary, 2011). Reading and writing written language involves a system of rules through which symbols are assigned meaning by a community for the practical purpose of communicating across space and time. Written language is a technology. It is just such an old and pervasive technology that we don't often think of it as such. None the less, technology and literacy couldn't be more clearly linked.

The technology of writing is one of the most remarkable inventions in human history, and one that seems to have developed independently in at least three ancient cultures. Although we are born with the innate capacity for language (Chomsky, 1968), we are not hardwired for reading. We must learn to read and write, and

through that process, we change the way our brains are structured, and so their capacity for thinking and learning. Maryanne Wolf (2008) writes, "Human beings invented reading only a few thousand years ago. And with this invention we rearranged the very organization of our brain, which in turn expanded the ways we were able to think, which altered the intellectual evolution of our species" (p. 3).

Indeed, what scholars like Ong (1982) and Piaget (1968) intuited through their studies of cultures and developing children respectively, neuroscientists can now see in the MRI images of literate and illiterate brains and in the brains of developing readers (Posner & McCandliss, 1999). Thus, literacy, and all its secondary meanings including knowledge, learning, culture, scholarship, and proficiency, has (probably rightly) been associated with a single communications technology–that of written language and printed texts.

Until now. For the past several centuries, the dominance of print over other communications media has been overwhelming and largely unchallenged. Recent decades, however, have witnessed rapid changes in how we communicate, entertain ourselves, conduct business, get information, create knowledge, and generally make sense of the larger world. Electronic texts are everywhere replacing printed ones as the media of choice in a wide range of human endeavors. Our notions of what it means to be literate are, or should be, correspondingly expanding.

Information Literacy

The term information literacy is relatively new. It was first employed in a 1974 National Commission on Libraries and Information Science report to describe the skills needed to use a variety of information tools to access and synthesize information from primary and other sources (Zurkowski, 1974). Indeed, the definition offered by the Association of College and Research Libraries (2011) today is simply "the set of skills needed to find, retrieve, analyze, and use information." However, as digital technologies have grown in importance, definitions of information literacy have expanded to include their myriad uses. Shapiro and Hughes (1994), for example, argued for information literacy being viewed as a "new liberal art that extends from knowing how to use computers and access information to critical reflection on the nature of information itself, its technical infrastructure and its social, cultural, and philosophical context and impact."

Digital technologies have also made multiple media formats commonly available, leading to the use of terms such as media literacy, visual literacy, and digital literacy to account for the skills needed to understand and critically analyze information represented in multiple forms (Lorenzo & Dziuban, 2006). Other terms have also been suggested. The National Research Council's Committee on Information Technology Literacy (1999), for example, used the term information fluency to stress the idea that information literacy is by necessity a fluid, as opposed to static, intelligence. The term information competency has been suggested as a way of including all the various literacies plus library, critical thinking and communications skills (Lorenzo & Dziuban, 2006). For the purposes of this essay, I will use information literacy to broadly reflect all such incarnations, understanding it to denote the knowledge and skills necessary to find, retrieve, analyze, synthesize, share and use information from a variety of media sources.

Our notions of literacy are historically, culturally, and socially determined (Jenkins, 2006). They are also grounded in the materiality of our means of communication (Bolter, 1991; Haas, 1996; Snyder, 1998). It is important to note that the term information literacy was coined at about the same time as digital technologies were beginning to assume a central role in organizing the ever increasing amounts information necessary to the functioning of our society. It is clearly linked to such technologies. Arguably, as digital technologies evolve, our notions of information literacy, and indeed literacy itself, must evolve with them.

Emerging Technologies and Information Literacy

The digital technologies of today are not the digital technologies of 1974. Digital technologies have rapidly evolved in ways most of us never anticipated when we first started thinking about information literacy. Most importantly, digital technologies are pervasive today in ways that were unimaginable in 1974. Just consider for a minute how much of everything you do in your professional and personal life involves digital devices of one

sort or another; or where you get the majority of your information. Indeed, digital technologies are becoming, like print, an invisible technology, "weaving themselves into the fabric of everyday life until they are indistinguishable from it" (Weiser, 1991, p. 94).

The sections that follow explore three consequences of the ways in which digital technologies have evolved: unlimited access to information, multimedia integration, and unprecedented support for collaboration–that are redefining information literacy and changing its relationship to teaching and learning. I am sure there are more and urge you to consider them.

Access to Information

The World Wide Web (WWW) is a scant fifteen years old, yet its growth has essentially redefined information literacy, ensuring its critical importance across academic disciplines. The growth of the WWW has made enormous amounts of information on just about everything available to anyone with a computer and a broadband connection. In 2007, for example, Thomas Boutell estimated that there were 108,810,358 distinct websites publicly accessible, containing approximately 29.7 billion pages of information. Obviously, such numbers are constantly and quite rapidly expanding. They render the notion that the purpose of education is the acquisition of scarce or privileged knowledge somewhat absurd, especially in the context of the open education movement (Open Courseware Consortium; 2011; Open Educational Resources, 2011; TED-ED, 2011).

The numbers do, however, highlight the problem of information overload and the need to be able to separate the wheat therein from the chaff. The numbers thus both amplify the importance of information literacy and expand its boundaries from the purview of librarians to knowledge and skills critical across the academic disciplines. The growth of the WWW and the concomitant seemingly limitless access to information provides educators with the opportunity, perhaps the imperative, to change their pedagogical focus from the transmission of knowledge, to pedagogies grounded in information literacy, regardless of their academic discipline, that they might enable students to both make sense of an overabundance of information and to use it to generate knowledge themselves.

Multimedia Integration

Concurrent with the growth of the WWW has been the growth of digital multimedia and the ready availability of relatively inexpensive multimedia tools. Digital multimedia makes it possible to access, evaluate, manipulate, create, and share ideas in a variety of media formats. According to YouTube (2011), for example, more than 24 hours of user-created videos are uploaded to their site every minute, and they are watched by hundreds of millions of viewers around the world. Virtually every news organization in the world today provides news and information not just in textual form, but in a wide variety of video, graphical, and interactive formats. The critical use and/or production of multimedia calls for intellectual skills and ways of knowing that are quite different from the manipulation of text and numbers privileged by higher education (Stephens, 1998).

The growth of digital multimedia thus challenges such privilege as well as our conventional notions of what it means to be literate (Snyder, 1998; Tyner, 1998). McClintock (1999), for example, argues that multimedia "make it increasingly evident that the work of thinking can take place through many forms–verbal, visual, auditory, kinetic, and blends of all and each" (¶ 13). Basic educational strategies, he argues, must accordingly be broadened to include the presentation, manipulation, evaluation, creation, and communication of knowledge in a variety of media forms, the intellectual recognition of such skills, and our notions of information literacy, indeed of literacy itself, need to expand beyond text.

McClintock (1999, ¶ 14) also points to digital tools designed to "augment human intelligence" (Englebart, 1963) tools ranging from digital calculators, word processors, databases, and spreadsheets to very complex modeling, statistical, and graphical software-and notes that these tools automate lower level intellectual skills, allowing their users to concentrate on higher level thinking. Together with multimedia representation, such

tools make rethinking the basic curricular question "What knowledge is of most worth" quite urgent. They too have significant implications for information literacy, and literacy itself, that revolve around the same question.

Collaborative Tools

Most recently, technological innovation has produced a suite of digital applications collectively (and perhaps unfortunately) labeled Web 2.0 and/or Web 3.0. The affordances are many and various, but the unique support of a range of Web 2.0/3.0 applications for the collaborative creation and organization of digital content is particularly relevant to the discussion of information literacy because they throw into question print-based notions of authorship, ownership of ideas, and authoritative sources. Web 2.0 tools, for example, have enabled the ongoing development of Wikipedia, the online encyclopedia written collaboratively by volunteers from around the world. At the time of this writing, Wikipedia had at least 75,000 active contributors working on over 10 million articles in 260 languages read by more than 684 million visitors a year (Wikipedia, 2008).

The success of Wikipedia and a host of similarly Web 2.0 enabled projects has led some scholars (Jenkins, 2006; Surowiecki, 2005; Tapscott & Williams, 2006) to argue that large scale collaboration, and not the individual labors of an elite few, will drive knowledge creation in the 21st Century. Although there are obvious problems with such arguments (Keen, 2007), Web 2.0/3.0 technologies clearly and explicitly support the social construction of knowledge, and so favor collaborative pedagogical approaches over individualistic and/or authoritative ones. It is too early to tell whether such changing approaches to knowledge creation will really take hold, but clearly they challenge the very important part of information literacy that considers the credibility of sources. Their effects on the music and newspaper industries suggest that the repercussions of large scale collaborative creation of knowledge becoming the norm would be widespread and dynamic.

Final Thoughts

Literacy means, first and foremost, the ability to read and write. Information literacy, a term introduced at a time when digital technologies were just beginning to move into the mainstream activities of our society and intimately tied to their use, is growing in importance as digital technologies become an increasingly integral part of our lives. I have tried to argue that information literacy is becoming nearly as central to academic endeavors as literacy itself. I believe that much is clear. What is less clear is what will become of literacy in the age of information literacy.

In a previous discussion, I noted that we are not born knowing how to read, and that learning to read and write changes the structure of our brains. Media scholars such as Elizabeth Eisenstein (1980) have documented how near universal literacy accordingly changed the course of Western culture to foreground many of the intellectual traits reading enables. The reason that human beings can learn to read and write is that our brains are plastic; they change in response to how they are used. There is some evidence to suggest that learning to use digital technologies to search for information also changes the structure of our brains (Carr, 2010). The question is then how might a digital revolution change the course of modern society?

What is different about the digital technologies of today, especially in relationship to print technologies, is that they are interactive, immediate, relational, generative, and uniquely participatory (Jenkins, 2006; Tapscott & Williams, 2006). What they are not is authoritative, linear, analytic or static. This worries some contemporary scholars (Carr, 2010; Postman, 1994; Turkle, 2011) who argue that the Internet is making us, if not stupid, at least not inclined toward thinking deeply and/or critically. Maryanne Wolf (2008), although a member of the worried camp, also points out that Socrates was similarly worried about the invention of writing. And like Socrates, no matter how worried we are about the consequences, we cannot stop the spread of digital technology. Wolf (2008) writes, "Our transition generation has an opportunity, if we seize it, to pause and use our most reflective capacities, to use everything at our disposal to prepare for the formation of what will come next" (p. 228). That, I would argue, should also be the mission of information literacy in these evolutionary times.

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Information Fluency-Global and International Perspectives

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Throughout human history, civilizations have been directed by discernible epochs in which revolutions in social and/or scientific thought have had profound impact on the ways in which we interpret ourselves, our interactions with others, our surroundings, and our place in the universe. Whether by means of material advances such as those of the Bronze and Iron Ages and the Industrial Revolution, or during periods of intellectual vigor such as the Renaissance, the Reformation, and the Enlightenment, paradigmatic shifts in our perspectives on material, social and spiritual phenomena have charted the course of human endeavor. Rather than the end of the Twentieth Century signifying a break in these successive periods of change, the processes of contemporary globalization, featuring some remarkable advances in technology, communications and economic development, look to dramatically influence the transition of human societies into the early decades of the third millennium.

This paper contemplates an aspect of current global processes, namely the explosion of information and its availability through Information Communication Technologies (ICTs). In particular it focuses on the emergence of a specific educational approach called Information Fluency (IF) which seeks to develop in students certain knowledge, skills, practices and dispositions to help them make sense out of the static produced by overwhelming amounts of information available, for example, through the Internet. The paper leaves aside related conceptual and practical considerations about the place of IF as distinct from and in relation to broader information and academic literacies. Instead, it takes it as given that the current milieu has created a legitimate space in which to regard competence for working productively, ethically, and critically with digitally-based and distributed information. Moreover, in light of the extensive flows of information across borders, attention will be given to global and international perspectives of IF to both contextualize and problematize its application in the real world and as experienced by students who increasingly encounter and work with digital information.

Unpacking Information Fluency

Whilst many readers of this journal are probably well informed of the meaning of Information Fluency (IF), it is worth outlining the process by which this author went about familiarising himself with what IF means because the exercise speaks directly to the concept itself. Where else to begin but with the convenience and power of the World Wide Web or Internet? (The terms "World Wide Web," "Web," and "Internet" are used interchangeably in this paper.) As "information fluency" was put into the search engine, a range of drop-down options appeared with the list becoming more refined by the time the penultimate letter was inserted (see Table 1.).

Table 1. Options and Results Provided by a Google Search for "Information Fluenc(y)"

Terms searched through www.google.com	Results (hits) 4 Mar 2011	Time to locate on 4 Mar 2011	Results (hits) 4 Apr 2011	Increase/decrease in hits in 1 month
information fluency	565,000	0.05 seconds	717,000	+152,000
information fluency conference 2011	445,000	0.19 seconds	2,070,000	+1,615,000
information fluency in the disciplines	129,000	0.38 seconds	1,950,000	+1,821,000
information fluency skills	571,000	0.24 seconds	7,170,000	+6,599,000

information fluency orlando	39,300	0.52 seconds	466,000	+426,700
information fluency ucf	17,500	0.21 seconds	57,800	+40,300
information fluency continuum	32,200	0.26 seconds	642,000	+609,000
information fluency definition	169,000	0.22 seconds	1,800,000	+1,631,000
research and information fluency	275,000	0.24 seconds	1,460,000	+1,185,000
ucf information fluency conference	14,400	0.23 seconds	74,300	+59,900
Totals	**2,267,400**	**2.54 seconds**	**16,407,100**	**+14,139,700**

Data in Table 1 show that in 2.54 seconds the search engine generated approximately 2,267,400 results on 4 March 2011 for a number of information fluency-related terms and an additional 14,139,700 results a month later. (It is unknown, however, how the search engine goes about its business and how accurate and legitimate the search outcomes are. For example, is it probable that approximately 6.5 million extra artefacts or references to "information fluency skills" were produced in a month?) The original search also suggested that the associated terms "digital information fluency" and "21st Century information literacy" had about 205,000 and 305,000 results respectively. Of interest, Google did not offer "information literacy" as a related term which itself resulted in about 6,940,000 hits in less than a second. A quick scan of the Uniform Resource Locators (URLs) for all terms indicated a range of generic Top-Level Domains (gTLDs), for example, "com," "edu," "net," and "gov." This suggests prima facie that many items from the IF web search originate in the United States, otherwise at least some of those same gTLDs would in all likelihood end with, for example, "com.au," "edu.uk," "net.fr," and "gov.ca," indicating an origin in other countries. (Although the World Wide Web country code for the United States is ".us," it is not widely found in practice.) It can tentatively be suggested, therefore, that the term "information fluency" originated in the United States (about a decade ago) and is specifically promoted *qua* "information fluency" (rather than, for example, "digital information fluency," "information technology fluency," and "information literacy") by a discrete but perhaps expanding number of stakeholders in (at least) that country. It is also recognised that broader conceptions of information fluency exist both within and outside of the United States that incorporate but do not solely focus on technology. See, for example, the Australian and New Zealand Information Literacy Framework edited by Bundy (2004).

Figure 1. Digital Information Fluency Model (21CIFc 2011)

Information fluency is stipulated by The 21st Century Information Fluency Project (21CIF) as an educative process that assists people to improve "*their ability to locate, evaluate and use digital information more effectively, efficiently and ethically*" (21CIF 2011a, italics in original). This process is expressed in Figure 1. A similar sentiment is promulgated by the University of Central Florida which defines IF as "the ability to perform effectively in an information-rich and technology-intensive environment (where people can) gather, evaluate, and use information in ethical and legal ways" (UCF 2011a). Further, the UCF initiative stresses that IF "encompasses and integrates three important and overlapping skills: information literacy, technology literacy, and critical thinking" (UCF 2011a). Note that UCF drops the word "digital" and simply uses "information fluency." Usefully, 21CIF also points out the difference between IF and both "print information literacy" and "information literacy," suggesting that electronic media in particular require users to possess specialised knowledge and skills, as well as certain personal dispositions to make informed and rational decisions at a high level (21CIF 2011b); hence "fluency" assumes a competence perspective that can be learned and assessed.

Let us briefly revisit the practicalities of the Web search for the meaning of IF to contextualise this section of the paper. Clearly, at over 14 million Web search "hits" by 4 April 2011, there exists a vast amount of information on the Web about IF, and it is a matter of being economical and discerning to locate useful and coherent sources to build a rudimentary understanding of the concept that not only has a content perspective but also situates it in other ways, for example, historically, conceptually, critically, geographically, and relative to related terms such as "information literacy" which itself can have a digital literacy component. To use some contemporary IF-type portmanteaus evident on the Internet, without being "infosavvy," the exercise would be "infowhelming." For an insight into this latter term, 21CIF has developed a video resource titled "InfoWhelm and Information Fluency" which addresses the idea of a "knowledge explosion" available via digital media. The video highlights a 10,000% growth in digital information over six years. A worldwide output in 2003 of 5,000,000,000 gigabytes (five exabytes) grew to 500 exabytes (500,000,000,000 gigabytes) by 2009. The equivalent information in hard copy would represent thirteen stacks of books from Earth to Pluto. This amount of information, available "24/7," is the game changer according to 21CIF and obliges us to reconsider approaches to learning and teaching" (21CIF 2011e).

It is worthwhile noting that close to 50 years ago, Reitan (1966) commented that the 20th Century had witnessed a "knowledge explosion" (p. 74) which "threatens to inundate our libraries and drive our scholars to despair" (p. 73). Reitan (1966) suggested (in the language of the period) that "the modern academic man must adapt himself to his new situation" (p. 75). His message was, rather than being overwhelmed by the sheer magnitude of information, education instead "must seek to capture the spirit of modern scholarship–its concentration on sharply defined problems, its vigorous methodology and criticism, its determination to probe deeply" (Reitan 1966, p. 75). This approach is fundamental to UCF's portrayal of IF which sees a need for people to develop strengths in information literacy and critical thinking to help manage and use digital information effectively.

So, is it a case of "the more things change, the more they stay the same?" Only to a point, for the third skill UCF promotes as part of IF is technology literacy which speaks directly to amazing developments in ICTs over the past few decades that have given rise to a need to conceptualise information fluency. See Figure 2 for examples of ICTs. Not only has there been an explosion of knowledge and information but much of this is made available via electronic means. Indeed, 21CIF make the (unsubstantiated) claim that "at home, at school and in the workplace, digital information is beginning to rival print as the primary format for information. Only 2% of new information created today appears in print format" (21CIF2011d). Elsewhere, Resta and Patru (as cited in Anderson 2010) report that presently "7,000 scientific and technical articles are published each day" (p. 10). It is anticipated that online publications and/or online availability of hard copy works would be a related dissemination and business feature. If such claims around the quantum of online information are legitimate, the need for IF-related knowledge, skills, and dispositions is glaringly apparent.
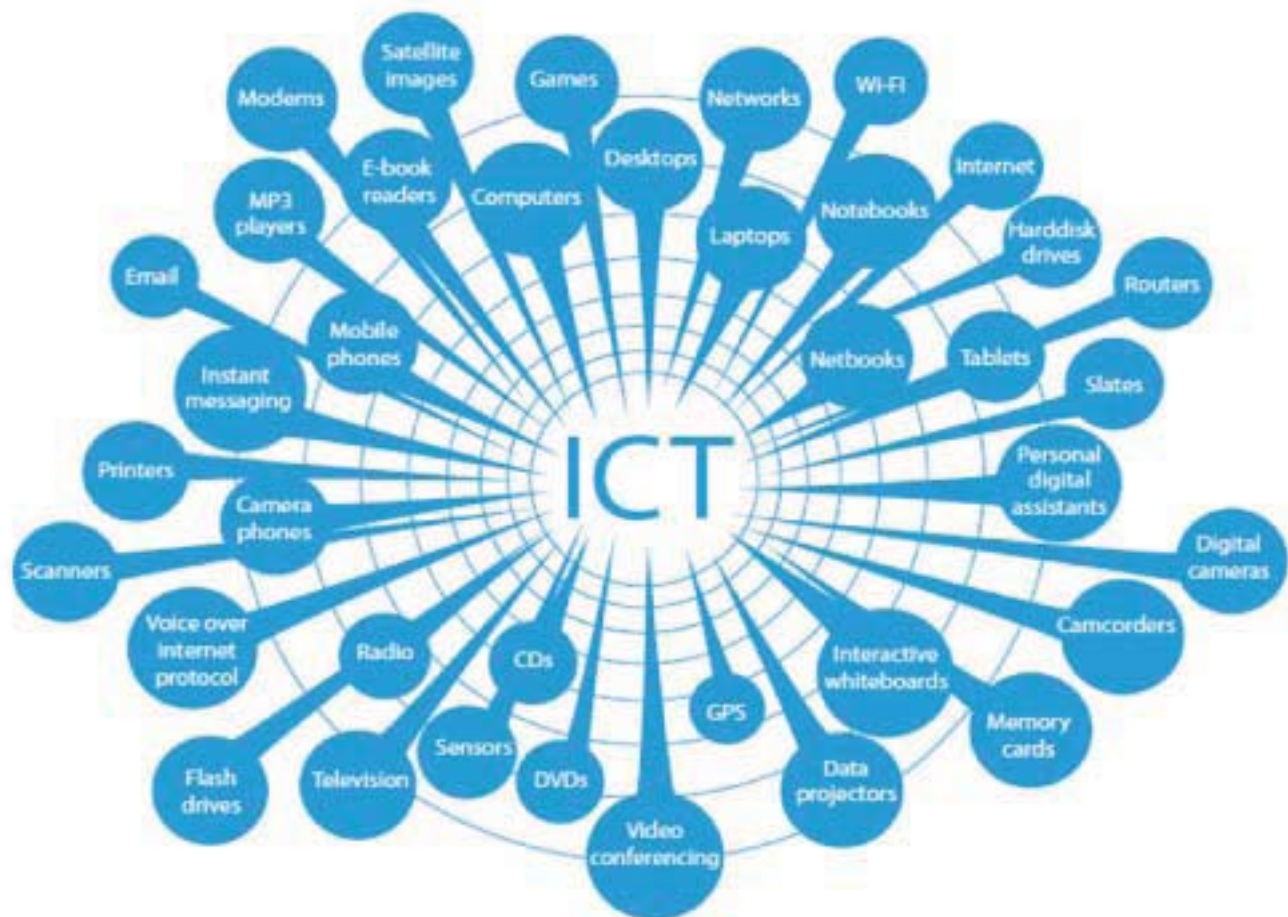

Figure 2. ICT Technologies that Capture, Interpret, Store, and Transmit Information (Anderson 2010)

Globalization and IF

Before focusing on globalization and IF it is important to initially provide a succinct overview of some of the main characteristics of "globalization" for the term is complex, slippery and often misunderstood. Held, Mc-Grew, Goldblatt, and Perraton (1999) offer a useful definition of the concept:

> A process (or set of processes) which embodies a transformation in the spatial organisation of social relations and transactions – assessed in terms of their extensity, intensity, velocity, and impact – generating transcontinental or interregional flows and networks of activity, interaction, and the exercise of power (p. 16).

Far from being known, the trajectory of current global processes is unclear. Further, global processes involve flows of, for example, people, ideas, finance, politics, culture and technologies that are contested and uneven and characterised by ironies and resistance. Some people argue that contemporary global flows signify a "new world order" where global mechanisms are superseding the function of the chief geo-political entity of the past 200 years; the nation-state. This "hyperglobalist" view forecasts the emergence of a truly global age of "one world, one economy, one people, one polity" in which national borders become meaningless. In opposition to this view are the "sceptics" who believe that nothing has changed and that "old world order" continues through the pre-eminence and dominance of the nation-state. The heart of the sceptics' argument is that "all the talk about globalisation is only that–just talk (. . .) the world carries on much the same as it has done for many years" and is at the whim of hegemonic powers (Giddens, 2002, pp. 7-8). A third position is held by the "transformationalists" who interpret global processes as having features of both the hyperglobalist and sceptic positions but with enough elements to distinguish itself from either. In the emerging environment, nation-states and national policies remain crucial, but nations are open to international trends and cross-border influences to an unprecedented extent (Considine, Marginson, Sheehan, & Kumnick, 2001, p. 6). Regardless of which position people subscribe to, there would be little argument that globalization has, for better and/or worse, created "overlapping communities of fate" by bringing the world's population "closer together" (Held, 2003, p. 180). Part of this "closeness" can be attributed to recent technological advancements, particularly in information processing and ICTs. Appadurai (1996) describes the global reach of such phenomena as constituting a "technoscape" of hardware and software that permeates borders that were once relatively impenetrable.

Given the "global reach" scenario that is evident above and the likelihood that the term "information fluency" seems to be largely confined to the United States at present, does it make sense to talk about "global perspectives" of IF at all, both in terms of terminology and the concept? After all, by definition "global" means "everywhere," that is, "affecting the whole world (. . .) total, including everything (. . .) worldwide, universal, all-inclusive, comprehensive, and wide-ranging" (Manser & Thomson, 1995, p. 544). This conjures up images of Iridium's "everywhere" claim where the communications company states that its 66 satellites provide "100 percent" coverage of the globe (Iridium, 2011). Not just here and there but everywhere (even where people are not!). Given IF is clearly not "global" in this sense the question might be better framed as, "Where and how might IF intersect with global flows?" and to this there are at least three main avenues of enquiry. The first can be leveraged by briefly considering the spread and utilisation of specific ICTs (and related Internet use) around the world given that technology is the *sine qua non* of IF. The second and third perspectives appeal respectively to internationalization-related themes around culture and approaches to learning, and education systems preparing students for life and work in a rapidly globalising world.

Spread of ICT Technologies

Whilst it would be interesting to consider global flows of ICT technologies in relation to their "extensity, intensity, velocity and impact," this paper will briefly look at only the "extensity" parameter and then only through the lens of access to the Internet to interrogate a case for a global perspective on IF. The crude assumptions made here are that *ceteris paribus* (1) Internet access is a de facto indicator of availability and use of computers, if not other ICT devices more generally, and (2) people with access to the Internet the world over will be faced with the challenge of having to become "infosavvy" to avoid "infowhelm" (connection costs and speeds and home

government content and software restrictions notwithstanding). Initially it might be tempting to think that a focus on IF is naturally appropriate for Western countries given their industrialisation histories and recent orientations towards service and knowledge economies. It is apparent, however, that amongst the estimated two billion Internet users worldwide in 2010 (see Figure 3), approximately 61% are from countries in Asia, the Middle East, the Caribbean and South America (Internet World Stats, 2010).

Further, in terms of locations with the fastest Internet connectivity, of the top 100 cities in the world 75 are in Asia and only 13 cities in America appear on the list (Akamai, 2010, p. 11). Whilst the statistics presented in this paragraph illustrate that Internet usage has an increasingly global reach, it is also worth pointing out the unevenness and constraints of this type of flow. For example, the United Nations Educational, Scientific and Cultural Organization (UNESCO) claimed that in 2007 less than four percent of people in Africa had Internet access and the monthly cost of a broadband service was prohibitively high at around US $250-300 (UNESCO 2007a). Whilst it is important to be aware of the existence of inequalities such as this, the main point for the purposes of this paper is that the *raison d'être* of IF – the spread of ICTs and the resultant access to incredible amounts of information – is a phenomenon that is not restricted solely to the United States nor other Western countries and as such an IF-like approach may well be useful for everyone who utilizes ICTs on a regular basis.
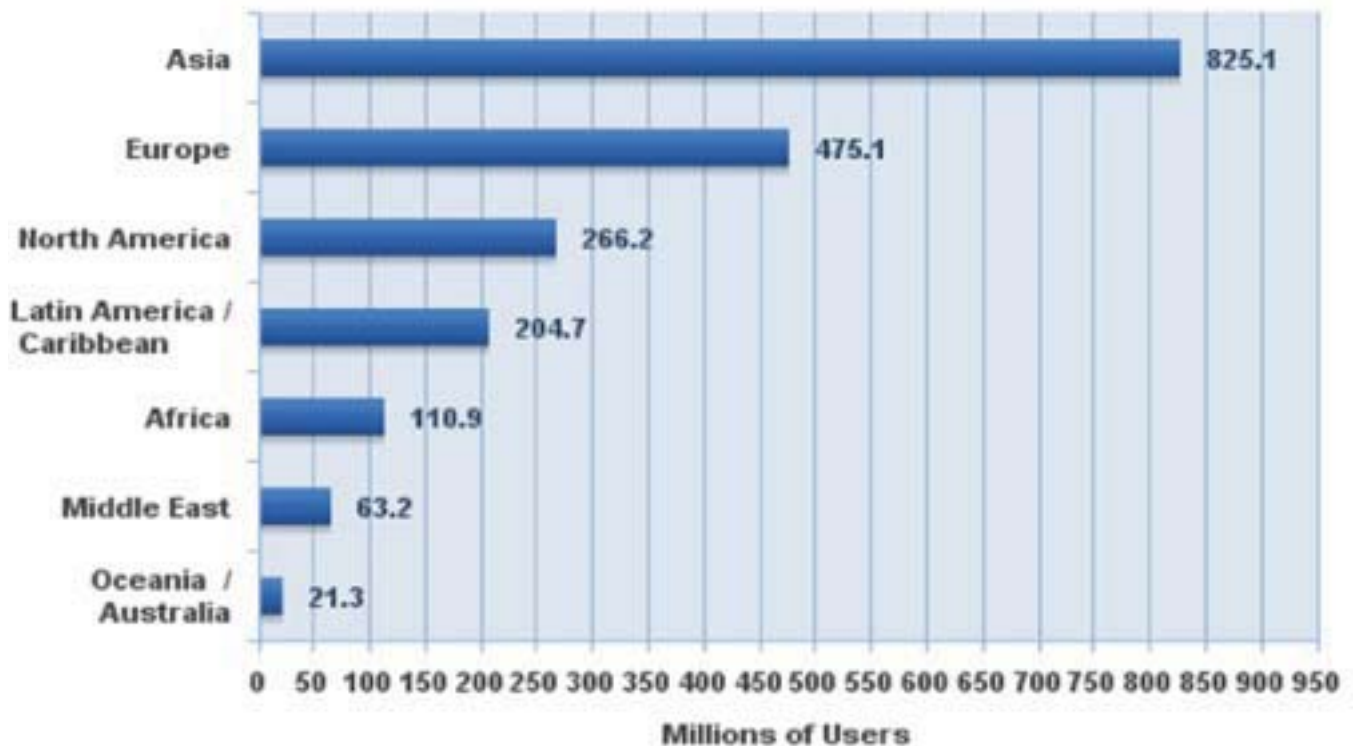

Figure 3. Internet Users in the World Geographic Regions 2010 (Internet World Stats 2010)

Culture and Approaches to Learning

A key issue in relation to the increasing spread of ICTs is how individuals and groups in cultures and countries respond to and utilise such technologies and the associated wealth of information available through the Internet. Also, from the point of view of other components of IF, how universal are the practices of information literacy and in particular, Western approaches to critical thinking? Consider, for instance, the way that Hofstede's (2001) model of cultural dimensions portrays groups from non-Western countries; particularly Asia. Looking at the Power Distance and Individualism-Collectivism indexes (see Table 2.), education systems in countries like China, Taiwan, and Japan are interpreted as conservative and teacher-centered. They foster some values and outlooks that are seemingly at odds with academic practices held in high esteem in Western settings such as

student-centered learning and students demonstrating initiative and developing critical and analytical skills and dispositions (Ballard & Clanchy, 1997, p. 13). To drive the wedge deeper, Biggs (2003) noted that Western faculty often perceive Asian students as passive rote learners who do not communicate in class or respond well to progressive Western teaching methods, focus excessively on assessment, do not understand what plagiarism is, do not adjust to Western academe easily, and consider lecturers to be gods (pp. 125-131).

Table 2. Key Characteristics in Education in Low Individualism and High Personal Distance Index Societies (Hofstede 2001)

Low Individualism culture (e.g. China)	High Personal Distance Index culture (e.g. China)
Teachers deal with pupils as a group	Teacher-centred (*sic*) education
Pupils' individual initiatives discouraged	Teachers are gurus who transfer personal wisdom
Schoolchildren report ethnocentric, traditional views	Teachers initiate all communication in class
Students associate according to preexisting (*sic*) in-group ties	Quality of learning depends on excellence of teachers
Students will not speak up in class or large groups	Students depend on teachers
Purpose of education is learning how to do	Authoritarian values independent of education levels

Note: Low individualism information sourced from Hofstede (2001, p. 237) and High Personal Distance Index sourced from Hofstede (2001, p. 107.)

From what has been outlined above, the expectation might be that education in these countries is not really geared to embrace IF and would resist it as a foreign way of thinking brought on by globalization. Indeed, perhaps students from these countries are just "hardwired" in different ways than Western students, and as such would be unable to develop IF-type competencies. Several responses need to be made to these sorts of claims. One is whether the Western educational approach should be promoted over all others as the only legitimate way of doing things in the hyperglobalist sense of being the 'one way' of learning and teaching for the world. After all, China, for example, has a rich education history and seems to be doing comparatively well as a developing country in many ways in this period of globalization. A sceptical interpretation is that the promulgation of Western ways of education and doing business, and more broadly capitalism and consumerism, is not much more than neo-imperialism at work.

Returning the focus to higher education, research has established that Asian classrooms produce educational outcomes, including high attainment and deep approaches to learning, which are comparable to, and at times exceed, those of Western educational settings (Biggs,1996, pp. 45-49). Dobson and Hölttä (2001) noted that statistical analysis of student performance demonstrates that international students studying in Australia actually out perform Australian students in business, arts, and science (including information technology) (p. 250). Also, as reported by Cannon and Newble (2000, p. 6) and Biggs (2003, pp. 125-126), there is a disproportionate number of Asian students who receive academic distinctions and prizes in Western institutions. Additionally, the sheer mass of Asian students returning home after successfully obtaining degrees from Western universities surely indicates that they have worked to a level of proficiency in educational systems that are said

to foster innovative, creative, and independent thinking (Australian Government, 2011). As such, it is foolhardy to suggest that students in Asian classrooms are incapable of developing IF-related knowledge, skills, and critical dispositions. This said, what cannot be discounted is the culturally constructed reality "on the ground" in those classrooms which may traditionally not encourage initiative and critical thinking in the way this is inter-preted in the West. However, whilst in Japan the saying goes that "the nail that stands up must be hammered down," culture and change are not mutually exclusive. Giddens (2002) remarked, "it is a myth to think that cultural traditions are impervious to change" (p. 40). Held et al. (1999), too, acknowledged that national cultural identities are mutable and potentially fragile (p. 328). Who can predict how global flows will impact on "estab-lished" cultures in the next 50 years, even if only in pockets of countries? For example, contemplate the pos-sibilities for cultural change and fusion as a result of the predicted increases by 2050 in the Spanish-speaking population in states like California, Arizona, New Mexico, Texas, and Louisiana.

Pondering further on arguments about IF as being suitable for Western students and ill-suited for students from Asian countries, it is timely to engage in some self-reflection. Whilst student-centered learning is valued in Western higher education, it is more aspirational than widely encountered. Watkins (1998) and Biggs (2003) noted that research has established that, in practice, much of the university teaching in countries such as Australia and the United States is more about lecturers being knowledgeable about their subject and imparting this knowledge to their students in a teacher-directed fashion. The commonly held view is that teaching and learning at Western universities proceeds in an altogether different way. Australian students, for example, do not arrive at university as highly trained critical and analytical thinkers. These qualities will be developed over several years of undergraduate study. In the meantime, Biggs (2006) makes the salient if unpalatable point that if examples are sought of students struggling to make the transition to university, learning by rote, not under-standing what plagiarism is, and not contributing in class, then look no further than local students in Australia and the United States (pp. 127-130). Perhaps one of the greatest opportunities globalization offers is a chance to reflect on our own assumptions and practices that we tend to take for granted. Clearly, local students need to develop IF knowledge, skills, and dispositions. If they came to the table with nothing to learn in this regard, then one would have to question the purpose and value of higher education.

Overall, it is disingenuous to think that the real world can be categorically explained and forecast using Hofste-dian cultural dimensions, especially in a time of extensive and intensive global flows. Also, when speculating on China's ability to embrace IF practices, perhaps it is too easy to confuse culture with the impact that politics has on restricting information flows, for example, state censorship through what is described as the "Great Firewall of China." The fact, however, that the country has an estimated 384 million Internet users (Ramzy 2010) and is variously understood as having between 100 and 300 million users of English indicates that flows of information in English and Chinese will more likely than not contribute to some interesting and challeng-ing social, political and educational changes in the future. As suggested by Ellis and Goodyear (2010), ICTs "affect people's expectations about what is normal and possible" (p. 2). Chinese students, like their Western contemporaries, simply have to develop some heuristic mechanism to help them make sense of the plethora of information emanating from the Internet; even behind the firewall. It is likely that an IF-like approach will be developed and adopted over time that could revolutionize learning in China. In the meantime, things are not standing still in the West where there is talk of a "fourth revolution" of innovative, ICT-based learning.

> The Internet and such services as Google and email, together with numerous newbie-products like Wikipedia, Skype, Facebook and Twitter, are transforming further the way we live, learn, work, and play (...) In suggesting the emergence of a possible fourth revolution (...) in some countries learning is moving beyond the walls of the classroom, and that new terms have been coined to express these innovative ways of learning, terms like: *m-learning* or mobile learning, and *u-learning* or ubiquitous learning. (Anderson, 2010, p. 7)

To invoke a proverb (and curse?) attributed to the Chinese, now everyone around the world lives in interesting times!

IF as Preparation for Life and Work in a Rapidly Globalising World

Knight (1997) commenting on internationalization in higher education, states that "*globalisation (sic) can be thought of as a catalyst while internationalisation (sic) is the response, albeit a response in a proactive way*"

(p. 6, italics in original). In this sense the process of internationalization plays an important role in "globalization from below" or "grassroots globalization" that acts in a "bottom-up" fashion on many "top-down" global forces. Often, it reasserts "the local" in the face of "the global" and an example of this reported in the previous section was China's firewall response to outside, Internet-based influences. Primarily, internationalization respects the legitimacy of nations and cultures and their worldviews and social practices. As such it appeals to the spirit of "internationalism," which is defined by Manser and Thompson (1995) as, "the view that the nations of the world should co-operate politically, economically, culturally, etc. and work towards greater mutual understanding" (p. 672). What might be the role of IF in this? UNESCO (2007b) sees a direct link in its assertion that "acceptance and recognition of cultural diversity–in particular through innovative use of media and ICTs–are conducive to dialogue among civilizations and cultures, respect and mutual understanding." What this is getting at is the imperative for people to learn to "live together" due to current global flows of economy, labour, technology, migration, and culture making the world a smaller place. This is the central thesis of the International Commission on Education for the Twenty-First Century (1996), which was UNESCO's clear response to the challenges presented by the current period of globalization.

It is assumed that university graduates will demonstrate mastery of a discipline and be able to competently go about their lives and work in technical, ethical, productive, and efficient ways, to name but some qualities. As a result of growing enmeshment and interconnectivity with all sorts of people in and from different places, there is also a need for individuals to understand, accept, respect, and work with cultural diversity. Rizvi and Walsh (1998) noted that "a more comprehensive awareness of difference and its implications for personal and social development has come to be seen as a profound feature of contemporary life" (p. 8). Kalantzis and Cope (2000) believed that all students need to become "comfortable with cultural diversity" (p. 31). In short, this is a call for a cosmopolitan disposition where individuals can feel at home in the world and crudely put, be able to live anywhere and get on with anyone. More specifically, a cosmopolitan outlook is usefully described by Tomlinson (as cited in Matthews & Sidhu, 2005) as "an intellectual and aesthetic sense of openness towards people, places and experiences from different cultures, especially those from different nations" (p. 53). Indeed, Held (2003) believed that "globalisation without cosmopolitanism could fail" (p. 182). Whilst IF should not be solely responsible for producing graduates with cosmopolitan outlooks, it does have a role to play if only by virtue of the range of culture-related information on the Internet that can be incorporated into curriculum. In this way, IF proficiency is equally applicable to faculty as it is to students. There is a wealth of Web-based culture-specific information that can enlighten students about cultures and countries. For example, there are language tuition and translation sites, as well as information on business and etiquette, cultural theory, photography, fables, history, maps, demographics, movies, art, architecture, politics, and literature, to name some cultural perspectives. In addition, the Internet offers opportunities for students in one country to work collaboratively through ICTs with students in other countries on assignments, projects, and presentations. Even for non-mobile students, the Internet and its resources offer unique opportunities for "internationalization at home" where learning outcomes based on international and intercultural perspectives are features of specific courses.

Conclusion

Given the fact that ICTs are becoming more widespread in many countries around the world, there should be little resistance to the suggestion that education is obliged to help students develop proficiency in their use and the ability to construct meaning out of the excesses of available information. The approaches outlined by the University of Central Florida and The 21st Century Information Fluency Project assert that IF requires more than simply accessing and assimilating information from the Internet. It also has ethical, legal, and critical evaluation perspectives. What has been suggested in this paper is that whilst such approaches are ostensibly suited to Western higher education, they should not be discounted as inappropriate for non-Western settings on the basis of cultural difference. It is important to note that such settings represent "different" rather than "deficient" educational approaches. Further, worthwhile aspirations should not be confused with the reality of how learning and teaching in Western universities plays out in the majority of instances for "local" students; both in terms of the teaching they experience and the needs they have as learners transitioning into and moving through higher education. What is apparent for all countries around the world is that global flows of ICTs and

related information will continue to transform education and in ways that perhaps are not yet apparent.

This paper has also suggested that IF has a role to play in helping students prepare for life and work in an historically unprecedented period of "thick" global transformations. In an age when both time and space are literally "compressed" by global flows, graduates need to be skilled in negotiating social and business environments characterised by cultural diversity and a reliance on changing technologies. During their time at university they need to be immersed in curricula that foster international, intercultural, and cosmopolitan perspectives and dispositions to make them adaptable in the face of cultural ambiguity and uncertainty. To this end, given the many and varied resources on the Web that can be mobilised with the aid of ICTs, the notion of information fluency should excite both faculty and students alike. As mentioned earlier, IF should not carry the burden of ensuring that graduates are prepared for life and work in the Twenty Frst Century. Indeed, this is a shared responsibility of a broader set of stakeholders than higher education alone. Nevertheless, IF looks to be a specialised information literacy whose time has come and is poised to make an impact in the lives of students and faculty around the world in one way or another.

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The "Write" Context: Embedding Information Literacy

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Introduction

Information literacy skills go hand in hand with other literacy skills, such as crafting arguments or producing robust textual and visual presentations. In a variety of specific contexts across the curriculum and in multiple disciplines, students are called upon to demonstrate simultaneously their ability to handle information, document sources, situate those sources in larger arguments or contexts, and consider multiple points of view. As students compose projects for particular audiences and particular rhetorical situations, they deploy different literacy skills to work through problems, issues, and debates so they might arrive at increasingly sophisticated insights and analyses.

Because of the rich and complex contexts in which students find and work with different kinds of information, capturing the demonstration of specific information literacy skills is often a tricky task. Our experience at the University of California, Irvine with large-scale, discipline-focused writing assessment shows us that students use information and steadily gain ground on developing "source integration"—the ability to weave multiple views, data, research, and other kinds of "evidence" into a variety of course projects, discipline-based genres, and robust textual and visual projects. The sources are clearly present in the writing, but how students found such sources, how they evaluated them, and what they have learned about the use of libraries and databases in the process of conducting research and working with information remains opaque.

In an attempt to capture a fuller sense of students' development of information literacy skills, the UCI Libraries and the Campus Writing Coordinator collaborated on a grant project funded by our Division of Undergraduate Education titled "First Year Student Information Literacy Assessment Project." The primary goal of this project has been to assess the information literacy levels of incoming first-year students and what they learn after their first year, when all of them are given rudimentary instruction in library research. We also looked more closely at discipline-based writing to see if we could catch a sense of how students handle information rhetorically—that is, how they situate information in their written work and employ it to do different tasks, such as persuade, contradict, or confirm. This article reports on our initial findings and suggests trajectories for future research as we attempt to understand the complexity of information literacy skills development.

Our Institutional Context: A Wealth of Writing—and Research—Opportunities

Information literacy assessment at UC Irvine has occurred in an increasingly rich context of writing assessment, directed by the Campus Writing Coordinator (CWC). Since 2008, the CWC has initiated direct assessments of writing produced in UCI's upper-division writing courses for the past three years and direct assessments of student writing produced in UCI's lower-division writing courses for the past two years. These efforts have been fueled by a commitment to better understand what writing skills and techniques students are able to demonstrate, the writing trajectory between lower-division and upper-division writing courses, and a desire to capture the degree to which student writing products demonstrate achievement of the learning outcomes for UCI's lower-division and upper division writing requirements.

Learning Outcome: Information literacy is an identified learning outcome for UC Irvine's General Education Writing Requirement.
Writing: Because of the importance of visual, oral, electronic, and written communication in every academic discipline, in the professions, and in public life, the University is committed to developing a variety of communication abilities in students at all levels and in all areas. The Writing Requirement expresses this broad commitment, but the concern for and attention to rhetorically effective, accurate writing is expected in all courses.

After completing this GE requirement, successful students should be able to do the following:

Lower-division writing:
- demonstrate rhetorically effective, accurate academic writing and communication across a variety of contexts, purposes, audiences, and media using appropriate stance, genre, style, and organization;
- develop flexible strategies for generating, revising, editing, and proofreading texts;
- develop abilities in critical reading across a variety of genres and media;
- and demonstrate information literacy skills by locating, evaluating, and integrating information gathered from multiple sources into a research project.

Upper-division writing:
- demonstrate rhetorically effective, discipline-specific writing for appropriate academic, professional, and public audiences;
- demonstrate at an advanced level of competence, use of discipline-specific research methods, genres, modes of development, and formal conventions;
- and demonstrate advanced information literacy skills by locating, evaluating, and integrating information gathered from multiple sources into discipline-specific writing.

(UC Irvine 2010-11 General Catalog, p. 57, http://www.editor.uci.edu/catalogue/10-11Catalogue.pdf)

Since 2008, 452 writing products (226 lower-division writing products and 226 upper-division writing products) have been assessed.   The upper division writing products that have been assessed over the past three years represent a wide variety of academic disciplines (Art History, Biology, Economics, Engineering, English, Informatics, Physics, and Social Ecology). The rubric used to assess these writing products was designed to determine the shared writing skills and techniques that exist across academic disciplines and is designed to capture students' ability to demonstrate the following writing skills: critical thinking and analysis, use of evidence/research, development and structure, and generic and disciplinary conventions. The lower-division writing products that have been assessed over the past two years represent the final writing product produced in order to complete UCI's lower division writing requirement. Because there are multiple pathways at UCI for completing the lower-division writing requirement, the rubric used to assess these writing products was designed to capture the shared expectations across lower-division writing courses, to begin to understand the unique writing skills developed by different lower-division writing courses, and students' ability to demonstrate the following writing categories: rhetorical knowledge, use and integration of evidence and sources, structure and organization, and language and style conventions (Schonfeld, 2010) .

The Campus Writing Director's efforts to assess student writing provided new opportunities for the libraries to assess the impact of library and information literacy instruction on students' information literacy levels. Dr. Megan Oakleaf outlines an Information Literacy Instruction Assessment Cycle (ILIAC) in her award-winning 2009 *Journal of Documentation* article, a cycle which she describes as being "grounded in 'assessment for learning' theory". The Information Literacy Instruction Assessment Cycle describes a seven-stage, iterative assessment cycle of setting and reviewing learning goals, identifying learning outcomes, creating learning activities, enacting learning activities (teaching), gathering data to check learning, interpreting data, and enacting decisions (Oakleaf, 2009). The UC Irvine Libraries Department of Education and Outreach has engaged in an assessment process, very similar to ILIAC, dedicated to assessing the results of the course-integrated instruction librarians provide for the lower-division writing courses since 2000. In 2009-10 alone, UC Irvine librarians taught 4,180 first year students enrolled in lower-division courses that fulfill the University's General Education requirement for Writing. The Libraries already collect evaluation and student learning data that documents the results of our instruction in each of these sessions. This data provides invaluable feedback as we strive for continuous improvement in our instruction program, but it does not take into account what the students know before the instruction takes place. As research librarians play an increasingly more visible and important role in teaching students how to locate, evaluate, and use information effectively, we need an assessment of student information literacy levels at the beginning of their first year of university so that we can measure improve-

ment over time. The Division of Undergraduate Education Assessment grant, with its emphasis on measuring student learning outcomes, motivated both the Libraries and the CWC to design a research project to collect data on the contributions of the Libraries to student learning.

Methodology and Project Design

The methodology of the First Year Student Information Literacy Assessment project is simple and elegant. The Assessment has two major components; a pre- and post-test of student information literacy levels at the beginning and end of their first year of university study, and a direct assessment of student work to measure information literacy competencies displayed in writing done for first year composition courses. The project is divided into six phases. This article summarizes our experience and findings through the end of Phase 3.

First Year Student Information Literacy Assessment Project Phases

Phase	Timeline	Activity
Phase 1	Feb-May, 2010	Identify/design instrument to measure student information literacy levels
Phase 2	June, 2010	Pilot use of instrument as a pre-test to identify any problems
Phase 3	Fall Quarter, 2010	• Administer pre-test to entering first-year students • Data analysis
Phase 4	Spring Quarter, 2011	• Administer post-test to exiting first-year students • Data analysis
Phase 5	Summer, 2011	• Review student writing samples including bibliographies and sources using a rubric to measure information literacy • Data analysis
Phase 6	Summer, 2011 and beyond	• Data analysis • Identify next steps and further research needed • Use assessment results to revise and enhance course curriculum • Use assessment results in Writing Instructors training • Summarize and share results of research through articles written for scholarly publications and presentations at regional, national and international conferences

As with any simple and elegant model, the details are essential to success. The first challenge was to identify an effective instrument (which we ultimately designated the Research Practices Survey) to use for the pre- and post-test of information literacy levels. The instrument had to be easy to administer, inexpensive (particularly because we would be administering it twice in one academic year to a large number of students), tied to actual student learning outcomes set by the Libraries and the University General Education requirement for lower-division writing, and reflect the ACRL information literacy competency standards. An additional challenge was that students would not be required to complete the survey as a course requirement although the lower division-writing instructors were instrumental in encouraging students to complete the survey. This meant that the survey had to be short enough to complete in a reasonable amount of time, challenging enough to gather meaningful information, but not so long and/or difficult that students would simply abandon it without finishing it.

After an extensive review and evaluation of existing information literacy assessments, we decided to create our own Research Practices Survey using the St. Olaf College Research Practices Survey as our model.

(http://www.stolaf.edu/offices/ir-e/assessment/instruments/RPS/RPS_SurveyInstrument.pdf) The St. Olaf's test was an excellent model because it was free and freely adaptable, as long as we gave attribution to the original in any publication of our results, asked the kinds of questions (both attitudinal and knowledge-based) that we wanted to ask, and could be easily adapted and administered using tools available in our University's course management system.

The final UC Irvine Libraries' Research Practices Survey (see Appendix for a copy of the survey) consists of 36 questions. Twenty-one of the questions are designed to capture students' attitudes and beliefs about research, including a free-text question which asks them for their personal definition of research, and a question which allows them to rate the importance of library research to undergraduates. Fourteen questions cover research terms, strategies, and the use of sources, and the last item is a free text field for student comments.

We administered the survey to a self-selected group of students during the summer 2010 quarter to pilot test the assessment. The results of that survey are not included in our final analysis, but the experience assured us that our test questions were adequate (more about this later) and that the method of administering the test and capturing the data was viable. The test "went live" during the first five weeks of fall quarter 2010 and we conducted our initial analysis of the results.

Data Summary and Analysis

A total of 777 undergraduates responded to the survey.   All respondents were enrolled in lower division writing program courses. The survey was administered early in the academic quarter to assess attitudes and beliefs about research and existing information literacy skills of students prior to exposure to formal university library research instruction.

Participants were asked to indicate, using a 4-point scale anchored by "very important" and "not important," their opinion on how important for undergraduates is the ability to conduct library research. Overall, 87% of respondents indicated that they viewed the ability to conduct library research as important or very important. Respondents were also asked to indicate, on a 4-point scale anchored by "very easy" and "very difficult," how challenging they found different components of the research process. Respondents could also select a "no experience" option if they had no prior experience with that element of research. Undergraduate respondents appeared to be fairly confident in their ability to conduct research, with responses ranging from 55% to 87% of respondents reporting that the different elements were either very easy or somewhat easy (see Table 1 below).

Table 1: **How Challenging are the Different Components of the Research Process for You? (n=777)**

	Very Easy	Somewhat Easy	Somewhat Difficult	Very Difficult	No Experience	No Response
Determining whether a source is appropriate for an academic project	36%	51%	10%	1%	1%	1%
Deciding what information from your sources to integrate into your project	30%	50%	17%	1%	1%	1%
Knowing when to document a source	29%	47%	20%	3%	1%	1%
Presenting information in an organized and logical manner*	28%	49%	18%	3%	0%	1%
Presenting information in an organized and logical manner*	23%	47%	23%	6%	0%	1%

	Very Easy	Somewhat Easy	Somewhat Difficult	Very Difficult	No Experience	No Response
Determining whether a source is appropriate for an academic project	36%	51%	10%	1%	1%	1%
Documenting my sources	23%	48%	23%	4%	1%	1%
Understanding the information in academic/scholarly sources	22%	50%	23%	3%	1%	2%
Knowing how to document a source	20%	52%	22%	5%	1%	1%
Refining a topic to meet the requirements of the assignment	18%	58%	20%	2%	2%	1%
Developing a list of sources to investigate	17%	53%	25%	3%	2%	1%
Revising my search strategy as necessary	16%	49%	27%	4%	2%	2%
Developing my main argument or thesis statement.	15%	40%	32%	12%	0%	1%
Writing my paper	14%	45%	31%	8%	1%	1%

*Note: This question was inadvertently asked twice on the initial version of the survey.

When asked how challenging it was to identify and retrieve sources, undergraduates reported a high level of confidence in their ability to retrieve sources through some mechanisms, but less ease, and less experience with others. Not surprisingly, an overwhelming majority of students (94%) report that using an Internet search engine is very easy (75%) or somewhat easy (19%). However, as the skill identified and tested becomes more specific, the less confident and knowledgeable the students' responses are. When asked about the ease of using an electronic index like EBSCOhost Academic Search or Expanded Academic or Reference Gold to find articles on a topic, more students report that they have no experience (40%) with using an electronic index, than report that it is very easy (10%) or somewhat easy (28%). The results are similar when students are queried on how easy it is for them to locate the full text of articles. Only 44% find it very or somewhat easy, while 33% admit that it is somewhat or very difficult, and 22% report that they have no experience locating article full text (see Table 2 below for details).

Table 2: How Challenging is it for You to Identify and Retrieve Sources? (n=777)

	Very Easy	Somewhat Easy	Somewhat Difficult	Very Difficult	No Experience	No Response
Using an internet search engine	75%	19%	4%	0%	1%	1%
Physically locating sources in a library	22%	48%	20%	2%	8%	1%
Using a print index	15%	29%	19%	2%	33%	1%
Using a library catalog like ANTPAC to find books.	13%	30%	18%	3%	36%	1%

Using an electronic index like EBSCOhost Academic Search or Expanded Academic or Reference Gold to find articles on a topic.	10%	28%	18%	3%	40%	1%
Locating the full-text of journal articles	8%	36%	28%	5%	22%	1%

Students' perceptions of their skills are one thing; what they can actually do is another. We asked participants to answer 14 multiple choice questions about their knowledge of library research. Questions ranged from application of knowledge (looking at a reference and identifying elements) to identifying correct and incorrect statements about library research. Scores ranged from 0 (no correct answers) to 14 (no wrong answers), with a mean score of 6.4 correct answers.

	Correct	Incorrect
Identifying the appropriate source for policies that address a topic	76%	25%
Identifying an entire book from a reference	75%	25%
Identifying the issue of journal based on a reference	74%	26%
Identifying when a citation is NOT required	71%	29%
Finding similar books on a topic	49%	51%
Identifying the appropriate source for commercial perspectives on a topic	47%	53%
Defining a citation	44%	56%
Identifying the appropriate source for the most recent scientific analysis of a topic	41%	59%
Identifying the appropriate source for background information on a topic	38%	62%
Finding a comprehensive list of relevant academic/scholarly articles	31%	69%
Identifying a journal article from a reference	28%	72%
Identifying accurate/inaccurate statements about academic journals/popular magazines	24%	76%
Identifying a book chapter from a reference	22%	78%
Identifying the appropriate source for an overview & summary of current status of a topic	16%	84%

Participants were also asked to describe their personal definition of research, and 731 students responded to this question.   Responses demonstrated substantial variation in students' understanding of the research process. Some of the personal definitions were focused tightly on finding information to support a specific argument or in response to a specific classroom assignment, whereas others focused more broadly analyzing and compiling information from multiple sources, or on exploration and the discovery of knowledge. The representative examples below demonstrate the breadth of themes addressed within personal definitions of research:

- "To look up information, understand, and put it in your own words."
- "Finding background information to help prove your point"
- "Research is looking for information that one can use in their paper."
- "Research is revealing the truth behind what is unknown and solving problems."
- "Research is retrieving resources, whether it be from the Internet or from texts at the library, and extracting information that will be helpful in supporting the thesis of a research paper."
- "Research: to study, or investigate a certain topic. Analyze it and share the results or argument with others."
- "An attempt to uncover something in a scientific method"

- "Research is either the creation of new knowledge, or the presentation of a new idea/interpretation using the knowledge/sources of other people."
- "Research is the process of collecting and compiling information about a certain subject"

Finally, ninety-three students provided a response to a closing question about whether they had further comments on the survey or on the topic of library research in general.   Approximately 35% of these comments were either a request or a suggestion for providing information/education regarding library research. About 12% of the comments made statements along the lines of "this survey showed me what I didn't know and what I need to learn."

Discussion

 This survey is intended to provide information on the beliefs, attitudes, and skills of the first-year, incoming undergraduates at a specific institution. As such, the specific attitudes, beliefs, and information literacy skill scores will probably be of less interest to those beyond this specific institution, than a discussion surrounding the usefulness to an institution of engaging in the assessment of their own students' information literacy skill levels. The results of this project will allow the faculty, course directors, and librarians to determine which information literacy skills are most in need of improvement and to develop tools and curriculum to address the areas of weakness.   The results will also provide information about the abilities, knowledge, and skills that students have at the beginning of their courses so that new knowledge can be more effectively introduced based on a firm understanding of what students already know.

We are still in the early stages of evaluating the results and disseminating them to faculty, but we have received significant interest from a number of quarters. Writing and librarian instructors have found this information useful in considering how and when to introduce and integrate fundamental and advanced information literacy concepts into research instruction sections or modify instructional plans based on the results. One example is the realization of the widely varying definitions of "research" among incoming undergraduates. Perhaps it would be useful to address these possible definitions early in writing courses to develop a shared understanding of what is meant by research.

Among some respondents, as demonstrated by comments about the survey, the survey itself proved a useful tool in that it demonstrated to some students that there were specific skills that they needed to develop or information that they needed to learn. In other words, students learned that their perceptions are not always in line with their abilities. Another approach to demonstrating the need for library research training might be to share with students that, on average, incoming undergraduates correctly answered fewer than half of the questions on a quiz about library skills. A similar use might be to present information to students about the disconnect between the high confidence in their ease of performing certain research activities compared to the relatively lower scores on assessments of related information literacy skills. For example, 70% of respondents to the survey indicated that "developing a list of sources to investigate" was either very easy or somewhat easy. In comparison, only 31% responded correctly to a question about the most effective way to find a comprehensive list of relevant academic articles. Similarly, 87% of participants responded that it was very easy or somewhat easy to determine whether a source is appropriate for an academic project, whereas only 24% correctly identified accurate and inaccurate statements about the difference between academic journals and popular magazines.

The discrepancy between student perception and ability may have very particular ramifications when we look at more specific skill sets, such as identifying appropriate and relevant sources for specific writing tasks. Direct assessment of student writing reveals that "source integration" is amongst the most difficult tasks that students face, both in writing for lower-division and upper-division, discipline-based courses. We define source integration here as the ability not only to determine the relevance and validity of a source (including data and evidence generated by the student, in addition to previously published scholarly work), but also the ability to show in writing how different sources and data are being used by the student. Do students use sources to bolster or

complicate their ideas? Or do they serve as useful points of counter-argument? Students tend to have the greatest difficulty in narrating in their writing how and why they are referencing particular source material. Significantly, this weakness parallels our findings in the pre-test; students did not score particularly well in the areas of "Identifying the appropriate source for the most recent scientific analysis of a topic," "Identifying the appropriate source for background information on a topic," and "Finding a comprehensive list of relevant academic/scholarly articles." An inability to identify appropriate and relevant sources may hamper students' ability to integrate those sources successfully into their writing. Such a potentially parallel finding is important for at least two reasons. On one hand, we should not expect students to have expert skills in such source identification and integration, particularly in terms of discipline-based writing, for which students need instruction. On the other hand, identifying this challenge both in terms of information literacy and writing will allow us to make specific curricular recommendations for both lower and upper-division writing instruction.

Of course, we are reporting here just on the pre-test and relevant findings from it. The administration of the post-test will take place during Weeks 5-10 of the Spring Quarter. We anticipate that it will be harder to motivate students to complete the post-test, given the competing demands of finals, and completing research projects but we are looking forward to the results in order to conduct the comparison between the entering and exiting survey results. However, one important piece of data which we will examine further, and which we will pay particular attention to in the exit survey, involves an examination of the results presented in Table 2: How challenging is it for you to identify and retrieve sources.   The results suggested that students have a high level of confidence in the ease of use of general skills (such as using a search engine), whereas they were less knowledgeable and confident about more specific discipline-based research skills (such as using an electronic index like EBSCOHost Academic Search). Similarly, this Table demonstrated a substantial difference in the ease that students report in using an Internet search engine and the difficulty in locating the actual full-text of a journal article (which gives one pause when thinking about the kinds of information sources that Internet search engines makes it so easy for them to find). Indeed, our initial analysis reveals that while students rate their overall research skills and abilities highly, they recognize and self-report that many of the more specific and academic aspects of source location and evaluation are difficult for them. This is hardly surprising, given that these students have just entered their first year of university study. University faculty and academic librarians often forget that students are not born with the ability to find, evaluate, and use information effectively and efficiently. Our survey results serve as a reminder of how important it is to provide basic information literacy instruction at the beginning of a student's academic career.

In addition to sharing the assessment data from the survey, we have learned lessons about creating and administering the survey, that may be commonsensical, but bear repeating for those who are considering designing their own large-scale information literacy assessments. The support of course administrators and instructors is crucial to student participation. By giving regular reminders to the students enrolled in their sections, and, in some cases, giving students "extra credit" for completing the survey, we managed to gather results from almost 25% of the incoming first year students. Furthermore, in our eagerness to make the pre-test as relevant to student's actual course enrollment as possible, we created multiple, but comparable, versions of the survey which were distributed to the students based on their course enrollment. Our initial results indicate that multiple versions are not necessary and administering one version of the test to all students will simplify the data analysis. Finally, we did not identify any problem questions during our initial pilot during the summer of 2010, but a more careful analysis of the results from fall 2010 highlighted two questions on presenting information in an organized and logical manner, where we asked the same thing in different contexts.   Interestingly enough, students indicated that this activity was slightly easier when it was surrounded by questions about using and documenting sources in a paper than when it was presented in the context of questions about defining the topic of the paper and searching for sources. We will eliminate this kind of duplicative questioning in future versions of the survey.

Conclusion

Many avenues of future research have been opened up for us as a result of this initial foray. In addition to the direct assessment of student work (which includes reviewing student writing samples with bibliographies and sources using a rubric to measure information literacy), we intend to survey writing instructors in order to

gauge their assessment of student skill levels in the areas covered by the student Research Practices Survey. For example, we will ask instructors questions like the following:

1. How challenging are the different components of the research process for your students? Please rate the difficulty of each of the following activities:
a. Refining the assigned topic to meet the requirements of an assignment.
b. Developing a list of sources to investigate.
c. Revising their search strategies as necessary.
d. Developing their main arguments or thesis statements.
e. Organizing their materials into a logical and unified structure.
f. Writing their papers.
g. Documenting their sources.

(1) Very easy ("My students can usually do this easily without assistance from an instructor, librarian, or peer tutor").
(2) Somewhat easy ("My students can usually do this with some initial assistance").
(3) Somewhat difficult ("My students need a fair amount of help to do this, but they can manage").
(4) Very difficult ("This is hard for my students even when they've received help").
(5) No experience ("My students don't any assignments requiring this kind of activity").

We think that the comparison between the students' perceptions of their ability and the instructors' assessment of the students' ability will help inform curricula development and identify gaps that can be addressed in both writing and information literacy instruction.

Finally, we should acknowledge that while this assessment project has produced immensely rich information about student writing products, it does not provide insights into how students search for, evaluate, and determine the information sources that they use to support their writing. We hope to pursue more concrete understanding of students' research processes in Phase 5 of this assessment project. Throughout, our goal will be to continue to understand better students' acquisition of information literacy skills both to inform curricular innovation in writing courses and improve library services. The acquisition of such skills is necessarily recursive, as students augment and alter previous knowledges and abilities; our assessments follow suit, helping us make substantive recommendations both for future study and for future students' learning.

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Appendix A

UC Irvine Research Practices Survey
Entering First Year
Final

The librarians at UC Irvine are interested in learning about your research practices. Your responses will help us focus our research instruction on areas that will best help you succeed in your lower-division writing courses and beyond.

Your Attitudes and Beliefs about Research

1. How challenging are the different components of the research process for you? Please rate the difficulty of each of the following activities:
   a. Refining the assigned topic to meet the requirements of an assignment
   b. Developing a list of sources to investigate
   c. Revising your search strategy as necessary
   d. Developing your main argument or thesis statement
   e. Organizing your materials into a logical and unified structure
   f. Writing the paper
   g. Documenting your sources

(1) Very easy ("I can usually do this easily without assistance from an instructor, librarian, or peer tutor")
(2) Somewhat easy ("I can usually do this with some initial assistance")
(3) Somewhat difficult ("I need a fair amount of help to do this, but I can manage")
(4) Very difficult ("This is hard for me even when I've received help")
(5) No experience ("I have not had any assignments requiring this kind of activity")

2. How challenging is it for you to identify and retrieve sources? Please rate the difficulty of each of the following activities:
a. Using a library catalog like ANTPAC to find books
b. Using an electronic index like EBSCOhost Academic Search or Expanded Academic or Reference Gold to find articles on a topic
c. Using a print index
d. Using an Internet search engine
e. Physically locating sources in a library
f. Locating the full-text of journal articles

(1) Very easy ("I can usually do this easily without assistance from an instructor, librarian, or peer tutor")
(2) Somewhat easy ("I can usually do this with some initial assistance")
(3) Somewhat difficult ("I need a fair amount of help to do this, but I can manage")
(4) Very difficult ("This is hard for me even when I've received help")
(5) No experience ("I have not had any assignments requiring this kind of activity")

3. How challenging is it for you to use sources? Please rate the difficulty of each of the following activities:
a. Determining whether a source is appropriate for an academic project
b. Deciding what information from your sources to integrate into your project
c. Knowing when to document a source
d. Knowing how to document a source

(1) Very easy ("I can usually do this easily without assistance from an instructor, librarian, or peer tutor")
(2) Somewhat easy ("I can usually do this with some initial assistance")
(3) Somewhat difficult ("I need a fair amount of help to do this, but I can manage")

(4) Very difficult ("This is hard for me even when I've received help")
(5) No experience ("I have not had any assignments requiring this kind of activity")

4. What is your personal definition of research?
Your Familiarity with Research Terms and Strategies
In this portion of the questionnaire, some of the terms and concepts will be familiar to you, but others will not. Please respond as accurately as you can, and feel free to use the "don't know" response wherever appropriate.

5. You retrieve the following information from the ANTPAC library catalog search:

Author:	Glover, David
Title:	**Vampires, mummies, and liberals : Bram Stoker and the politics of popular fiction / David Glover**
Published:	Durham : Duke University Press, 1996

LOCATION	CALL #	STATUS
Langson Library	PR6037.T617 Z67 1996	NOT CHCKD OUT

Send via Text Message   ?

Description:	x, 212 p. : ill. ; 24 cm
Subject - LCSH:	Stoker, Bram, 1847-1912 -- Criticism and interpretation -- History
	Popular literature -- Great Britain -- History and criticism
	Politics and literature -- Great Britain -- History
	Horror tales, English -- History and criticism
	Vampires in literature
	Mummies in literature
	Sex in literature
Note(s):	Includes bibliographical references (p. [191]-205) and index
ISBN:	0822318032 (cloth : alk. paper)
	0822317982 (paper : alk. paper)
Library of congress call number:	PR6037.T617 Z67 1996
Permanent Link to This Record	http://antpac.lib.uci.edu:80/record=b2422706~S7

Which of the following would be the most efficient way to find a comprehensive listing of other books in the catalog on this topic?

(1) Identify other books written by the same author
(2) Examine the bibliography in the book
(3) Scan the shelves where the book is located to see what books are nearby
(4) Search again using the subject headings that most closely match your research topic
(5) Don't know

6. Which of the following is likely to yield the most comprehensive list of relevant academic/scholarly articles for a research project?

(1) Searching an electronic index or database in a specific academic field (History, Biology, Music, etc.)
(2) Using a general Internet search like Google or Yahoo
(3) Paging through print volumes of an academic journal in a specific academic field
(4) Searching the library catalog
(5) All of the above are equally effective
(6) Don't know

7. You find the following entry in the References section of a recent article:

Erisman, H.M. (2002). The Cuban Revolution's evolving identity. Latin American Politics and Society 44(1), 145-153.
In what issue of Latin American Politics and Society will you find this article?
(1) Volume 2002, Number 44
(2) Volume 44, Number 1
(3) Volume 1, Number 145-153
(4) The issue cannot be determined

8. For each of the following, indicate whether the item is an entire book, a journal article, or a portion of a book.
a. Loftus, Elizabeth. "Memory Distortion." In The Foundation of Remembering, edited by James S, Nairne. New York: Psychology Press, 2007.
b. Canadell, Josep G. and Diane E. Pataki. Terrestrial Ecosystems in a Changing World. (2007)
c. Mulvey, Laura. "Visual Pleasure and Narrative Cinema." Screen 16 (1975): 6-18.

(1) Entire book
(2) Journal article
(3) Portion of a book
(4) Don't know

9. In a scholarly/academic article or research paper, a citation is:
(1) A direct quotation from someone else's written work
(2) Source information for any ideas or text from someone else's written work
(3) The physical location of a source (book, journal, etc.)
(4) All of the above
(5) Don't know

10. A citation is NOT required when:
(1) You are paraphrasing, rather than quoting, a source
(2) More than one source says the same thing
(3) You are describing your own findings or analysis
(4) All of the above
(5) Don't know

Use of Sources
11. Researchers must distinguish between academic/scholarly journals and popular magazines. Which of the following statements is LEAST ACCURATE?

(1) Academic journal articles provide objective facts; popular magazine articles do not.
(2) Articles in academic journals usually include a list of references to other scholarly works; articles in popular magazines usually do not.
(3) The intended audience for academic journals is mainly other scholars; the intended audience for popular magazines is the general public.
(4) Authors and editors for academic journals are usually employed in higher education; authors and editors for popular magazines are usually employed by the for-profit media.
(5) Don't know

12. You are required to write a research paper on an environmental issue for your Writing 39C class. You decide to investigate the use of solar energy as an alternative energy source. How would you use the following resources to complete the assignment? Select the aspect that the resource would be MOST LIKELY to help you with.

A. Journal article on technical barriers to solar energy use
B. Book on solar hydrogen generation
C. Wikepedia entry on the topic of solar energy
D. Solar Energy Industry Website
E. Website that includes current Federal legislation

1. Overview and summary of current status of topic. (B)
2. Policies that address the topic (E)
3. Commercial perspectives on topic (D)
4. Background information to learn about topic (C)
5. Scientific analysis of topic (A)

13. In your opinion, how important is the ability to conduct library research to academic success as an under-graduate?
A. Very important
B. Important
C. Somewhat important
D. Not important
E. Don't know

14. Do you have any further comments related to this survey or to the topic of library research in general that you would like to share?

Editorial Board/Peer Review Panel

Cover Art

Glenn H. (Hank) Lewis, MBA
Managing Editor, *Journal of Information Fluency*
Information Fluency Initiative, University of Central Florida

The picture on the front cover speaks volumes about the use of the Internet in academia. The quote is from Mithcell Kapor, a pioneer in the personal computing world and an entrepreneur, software designer, investor, and activist in information technology (http://www.kapor.com).

For faculty and researchers, it is often difficult to keep up with emerging technology and use it to manage information effectively. For students, researching an assignment without knowing how to effectively use search engines can lead to many irrelevant, dated or bogus information sources. Overwhelming does not begin to describe how it can feel when a student puts in a keyword or a string of keywords and gets thousands of sites available to assist in research efforts.

Finding ways to better manage research efforts and information sources is what information fluency is all about: gathering efficiently, evaluating effectively and using ethically the massive amount of information available on the Internet and elsewhere. John Allen Paulos, Professor of Math at Temple University describes the internet as "the world's largest library. It's just that all the books are on the floor."

In each issue we will share a picture and quote that speaks to informatin fluency. We welcome your contributions.