Information, Knowledge, Cognition

and the Crisis of Understanding

Sabbatical Project

Submitted to the Salary and Leaves Committee

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Sabbatical Project Proposal for Fall 2008-Spring 2009
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Project Overview:

Few of us realize that the terms "knowledge worker" and "Knowledge Age" were conceived almost 50 years ago (in 1959 by management guru Peter Drucker); just this year an updated version, the "knowledge worker 2.0," was coined to indicate the evolution of the initial concept. The idea that that we have undergone a "Knowledge Revolution," coupled with continuing advances in information technology, has profoundly changed the intellectual and educational landscape that we, and our students, inhabit. But have our pedagogical ideas and theories kept pace with this change?

Although I teach the research process in my composition courses, I know from my own academic research over the past seven years that the nature of information and how to process it has transformed far beyond note cards and how to write a parenthetical citation. How do we teach students to use new technologies, to research information in an ever-expanding universe of ideas, and to understand and articulate that new knowledge in useful ways? The field of knowledge work has developed to answer just such questions in both the workplace and the classroom. As Jeremy Shapiro and Shelley Hughes suggest in "Information Literacy as a Liberal Art":

> ...information literacy should in fact be conceived more broadly 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 even philosophical context and impact – as essential to the mental framework of the educated

> information-age citizen as the trivium of basic liberal arts (grammar, logic and rhetoric) was to the educated person in medieval society.[1]

In fact, Shapiro and Hughes argue that a truly useful curriculum would include seven dimensions of information literacy: tool, resource, social-structural, research, publishing, emerging technology and critical literacies. Teaching even part of this list constitutes an enormous pedagogical task, yet neither our curriculum nor our students' skills have kept pace. As Alison Head discovered in a 2007 study of college student research conducted at St. Mary's College (CA), "Many students were challenged by research tasks, especially selecting and evaluating information and figuring out professors' expectations for quality research."[2] She concludes, "Though students clearly have an avid use [*sic*] of MySpace and YouTube, this does not mean college–aged students are natural–born researchers… Conducting secondary research remains a formidable task, learned through coaching and honed with practice."

So it would seem that the question of how to teach our students to research and process information is more vital, and necessary, than ever. And methods of teaching research that may have been current five (or ten) years ago are no longer adequate. The many theories within the larger field of knowledge work or knowledge acquisition may seem disparate, but they are actually interdisciplinary and interrelated. While Information Literacy (IL) has been most connected to the discipline of library science, Michael Eisenberg and Robert Berkowitz have developed an information literacy curriculum, known as the Big 6, for K-12 and higher education courses. In another instance, new insights in cognitive psychology and neuroscience are changing our understanding of

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[1] James Shapiro and Shelly Hughes, "Information Literacy as a Liberal Art," *Educom Review* 31.2:1.
[2] Alison Head, "Beyond Google: How Do Students Conduct Academic Research?," *First Monday* 12.8:2.

how we learn and process new information; the connection between such insights and the liberal arts is being explored in a field known as Theory of Mind (ToM). Furthermore, the pace of insight and invention in the field of knowledge work continues to grow at an ever-increasing rate; even more recent concepts like Integrative Learning and Learning Communities continue to evolve from this field. So to develop a better understanding of these changes, I propose a study that will provide an overview of the larger field of knowledge work accompanied by more detailed studies of two of its individual theories. I also propose to collect data from four-year college and universities to assess what knowledge acquisition and research expectations they have for their students, and how they incorporate these new modes of research pedagogy into their curriculums.

Project Report

The project report will cover two main areas (a) theories of knowledge work/knowledge acquisition and research pedagogy and (b) how such theories are incorporated into the curriculum of four-year universities/colleges.

First, I would like to survey the larger field of knowledge work/knowledge acquisition resulting in a historical overview/survey of the field. I would then like to explore two of its theories in more detail. While it is difficult at this juncture to know which of the theories are most applicable to community college students, I think Information Literacy/Big 6 and Theory of Mind seem most applicable to my discipline. I propose to do more detailed reading and research into these two theoretical fields, which will result in short (20-25 page) explanatory papers and annotated bibliographies for each.

Second, I will investigate research requirements/pedagogies at a representative sample of four-year institutions. For instance, Cal State San Marcos is considered one of the leaders in information literacy at the four-year level. In addition to Cal State San Marcos and other area colleges, I propose to contact colleagues at other institutions such as Southern Illinois University-Edwardsville (IL), College of Charleston (SC), Sam Houston State University (TX), Hollins College (VA), University of North Carolina-Asheville (NC) and Eastern Michigan University (MI), among others, to create a diverse sample of four-year colleges/universities. Such a representative picture of how information literacy and other approaches are incorporated into other institutions' curriculums should prove very useful. This will result in a detailed survey outlining the various approaches, and requirements, at these institutions.

Thus, the final report will provide both overviews of the various methodologies and a survey of actual practices. This format will allow anyone using the report to understand the changing field of knowledge work/knowledge acquisition, as well as provide a comparative understanding of how other institutions are implementing these changes.

Benefits to Students, Department and College

This project will benefit myself, my students and my department. As a teacher, such an in-depth study will expand my own understanding of knowledge acquisition and information literacy. Since research is a required part of the freshman composition (English 1A) curriculum – as well as something I wish to further incorporate into my critical thinking transfer classes (English 1C) – I think this course of study will allow me

to teach information literacy, research skills and critical thinking in more productive ways for my students. I know from my own classroom experience that my students' research skills are weak at best, so anything I can do to improve their learning and skills would be productive. This project will also benefit the English, Literature and Journalism Department by providing an overview of the current state of information literacies, both theoretical and practical, as well as more specific information on how such skills are taught at the four-year level. This knowledge will allow us to better assess the skill sets of our students, to reconsider classroom techniques, and to bring new ideas and concepts to curricular decisions.

This project will also benefit the larger Mount SAC community as the ability to understand and integrate new knowledge is a fundamental skill for student learning and education in all disciplines. A recent study by the Association of American Colleges and Universities, *College Learning for the New Global Century*, outlines Essential Learning Outcomes that will "provide a new framework to guide students' cumulative progress – as well as curricular alignment – from school through college." They include (1) inquiry and analysis, (2) critical and creative thinking, (3) written and oral communication and (4) information literacy as four of the six "Intellectual and Practical Skills" learning outcomes.[3] These are skills that the English Department is committed to teaching, but certainly they are skills that our other disciplines/departments require from their students. As both the SLO and the GEO process continue, this kind of research can provide us with insight into the needs of our students, as well as better ways to serve those needs.

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[3] Association of American Colleges and Universities, *College Learning for the New Global Century*, 2007. 76.

Proposed Timeline

September 2008: Reading/Research for Historical Overview of the field of Knowledge Work/Knowledge Acquisition

Representative readings to include: Drucker; Toffler, *The Third Wave*; Senge, *The Fifth Discipline*; Davenport, *Thinking for a Living*; Wurman, *Information Anxiety*; Hayles, *How We Became Post-Human* among others

October-November 2008: Research, Reading and Writing of Annotated Bibliographies on Information Literacy (IL) and Big 6

Representative readings to include:

a. Irving, *Study and Information Skills Across the Curriculum*; Doyle, *Information Literacy in an Information Age*; Kulthau, *Seeking Meaning: a Process Approach to Library and Information Services*; Bruce, *The Seven Faces of Information Literacy*; Eisenberg & Berkowitz, *Information Problem Solving*; Shapiro & Hughes, "Information Literacy as a Liberal Art"

b. See also the attached bibliographies of representative journal articles from the *Association of College and Research Libraries'* website on Information Literacy

December 2008: Research, Reading and Writing of Annotated Bibliographies on Theory of Mind (ToM)

Representative Readings to Include: Gardner, *The Mind's New Science: A History of the Cognitive Revolution*; Johnson, *The Body in the Mind*; Hirschfield and Gelman, *Mapping the Mind*; Schacter, *Searching for Memory*; Hogan, *Cognitive Science, Literature and the Arts*; Turner, *The Literary Mind*; Crane, *Shakespeare's Brain* among others

March 2009: Writing of Historical Overview; Essays on IL and ToM; and the first half of the Sabbatical Report

April-May 2009: Research, Data Collection and Analysis of Representative Four-Year Institutions: see list of universities/colleges above

June 2009: Writing of Survey Report and final half of the Sabbatical Report

Narrative Report

As with all research projects, the outcomes and conclusions of this study bear little relationship to my initial thoughts and inquiries. As I consistently remind my own students, the word research can be broken down into the prefix re-, meaning "again," and the root word, "search"; in other words, the very nature of a research project is to enter into a process, or journey, whose destination is unknown and unchartable without the pursuit of the process itself. In this instance, it was a number of months before I realized that any one of the three topics I initially proposed would have been more than enough for one sabbatical year length project: knowledge theory, information literacy and, most especially, cognitive science are not only huge fields of knowledge on their own, they are constantly changing in light of new technologies and research. We are indeed in the midst of the Knowledge Revolution, a fact that became ever more clear as the year, and my studies, progressed.

I began by reading the texts I initially proposed since they seemed to be the initiating works of knowledge theory. However, when I picked up my copies of *Megatrends*, *Future Shock*, and *The Third Wave* among others, even the librarian was taken aback by how, well, old these books seemed. And they proved to be not only old, but outdated. Fortunately at this time, I was also reading references to seemingly unrelated works like Stewart Brand's 1999 *The Long Now*, Alex Wright's 2007 *Glut* and Malcolm Gladwell's 2008 *Outliers*. I didn't realize it at the time, but this was the first indicator that most of my reading would be taken from the last ten years with only a few

older texts able to play a useful role as I explored the information age and knowledge theory.

Many similar insights became apparent as my reading progressed. One was a persistent emphasis on the importance of metacognition in order to move beyond knowledge acquisition and into understanding knowledge itself. The best of the older texts, such Wurman's *Information Anxiety* and Roszek's *Cult of Information*, were those that addressed the issue of how to approach the information onslaught and how to understand the information within it. In other words, the more pragmatic and focused on techniques of critical thinking, the better the text. Unfortunately, those texts that tried to specifically predict the future, *Megatrends* and its kind, were not particularly useful five, ten or fifteen years out. This is because no one writing and thinking in the late 70's, the 80's, 90's or, even in some cases, the early part of the 21st century could truly anticipate the breadth and speed of technological change or its global impact. The best way to put it is that those thinkers who were focused on the abstract, the ability to process and adapt, even to welcome change, proved much more prescient than those attempting to concretely outline that change. So it quickly became best to focus on the works of those who are considered information architects: i.e. those whose field professional specialization is the synthesis and evaluation of information and knowledge theory. By far the best were Wurman's *Information Anxiety* and Wright's *Glut*. Both Wurman and Wright are information architects and designers whose focus is on new and useful ways to present knowledge. Wurman designed the *Access* series of travel books and maps which were the first travel guides to provide a visual, contextual approach to travel information rather than merely listing information. In a similar way, *Information*

Anxiety's was designed to make the issue of information anxiety manageable. Its 1989 publication date should have made it outdated as it was written long before the advent of email, the World Wide Web, cell phones, Twitter and Facebook. Yet I found myself returning to it again and again since Wurman's focus on how to deal with information rather than the technical methods with which to communicate that information was one of the key insights in this text, and eventually this project.

At one point during the reading for this section and for the section on cognitive science, I reached a point that has been described as data smog. There was just too much information and I was not sure at all what do with it. So I decided to review what I had read so far. It was when I reviewed Alex Wright's *Glut*, a text I had read early on in the process and but didn't see the significance of with my initial inquiry, that I was finally able to put this project in focus. Also an information architect – among other projects Wright has worked on the Long Now Rosetta Stone Project and designed the iPhone application for the *New York Times* – Wright' study is a synthesized view of the whole history of how humans have processed information. He emphasizes that there have been multiple "revolutions" in the history of knowledge and that many of the technological innovations in literacy have impacted or created revolutions in history. That is when I realized how many ties this project has to my studies as a medievalist. While one of the reasons I initially picked some of these topics was to explore some new fields, I realized that when I teach the survey of British Literature, one of the continuing themes is how technological and historical change drives changes in human cognition and creativity. In many ways, much of what we are experiencing today was what the Europeans of the late Middle Ages experienced as economic, political and religious strife led to social and

technological changes that in turn led to the Renaissance and the Reformation. Indeed, what we are experiencing is "new" in terms of size and technology, but not at all new in terms of our human ability to react and adapt to change. So it became clear to me that one important thing my study could do was to focus on placing current developments within their larger historical context.

Accompanying this was the insight that it was necessary to focus much more on current research and thinking. Much of the most useful and productive reading I encountered was work that came out over the course of the sabbatical year itself or even since I had initially written the proposal. Many of the texts I found helpful for both this section and the section on cognitive theory, such as Malcolm Gladwell's *Blink* and *Outliers* and Daniel Pink's *A Whole New Mind: Moving from the Information Age to the Conceptual Age* came from recent best-seller lists; a development which I was not expecting at all. I also discovered many readings from blogs and magazines rather than academic journals. This is yet another indicator of how rapidly the technology of information itself is changing. It is also an indication of how we are becoming better at processing and adapting to it. In all, I found this section to be the most interesting of the three and found myself returning to this reading and topic again and again. While I initially wanted to investigate this topic because of my students – after all they are the ones we tend to focus on as being the future of knowledge work – this study made me realize how important it is for us to stay current, not just in our own disciplines, but in general. We are indeed living in a period of vast change, and both as educators and as individual, we need to maintain familiarity with both new information and our ability to adapt to it.

This was also the message of my reading in information literacy. The term and the concept have only been around since 1974, but its importance has grown every year since. Information literacy is at once straightforward but difficult and complex. This is because the actual concept and definition of information literacy is very clear; it has been fully defined and clarified by the ALA (American Library Association) and the ACRL (Association of College and Research Libraries). However, the issue of teaching, learning and assessing information literacy is much more difficult. The studies indicate that all students from elementary school through graduate school have weak information literacy skills despite their comfort level with digital technology. So the question becomes how to enact information literacy as more than a policy.

While initially I was going to focus on the pedagogical model known as the Big 6, I soon discovered that Carolyn Kuhlthau's research and model was the best emphasis for my study. Not only is she one of the founding researchers in the field of information literacy, but her research and model are designed for higher education. In fact, most of the research in the field of information literacy has focused on K-12 education. Meanwhile, most of the formal research in higher education has been in the discipline of library science rather than in English, composition or education. In fact, almost all information literacy education is conducted via college and university libraries. And in many ways, this is the best option as librarians have to stay current in information technologies in ways professors in other disciplines do not.

However, what did become clear during this portion of my study is that we cannot rely on our libraries and librarians to do all the work for us. One of the reasons I wished to study this field was to assess ways in which it might be necessary to my own teaching

and my own field. It quickly became clear that as a field, English composition has not really kept up at all with these developments: either the technologies nor the research. And as we will see, the SAC English, Literature and Journalism is certainly not alone in that. But it is very apparent after my reading that information literacy should be a part of *every* class we teach at Mt. SAC as it is not discipline specific, but rather a truly essential life skill and one which is truly interdisciplinary.

Once I began reading the cognitive science portion of the project, I realized that this was a huge field and frankly one far too large and technical for this project. Cognitive science is a field which encompasses developments in philosophy, psychology, artificial intelligence, linguistics, anthropology, and neuroscience. To say I was overwhelmed from the beginning is something of an understatement. I also quickly realized that the focus I had initially proposed, the theoretical application of cognitive science to literature known as Theory of Mind, was essentially useless for my purposes – especially in light of the other issues I was considering for this project. While an interesting theoretical approach to literature, Theory of Mind has gained little traction in the field of literature. But most of all, I could quickly see that it would have little practical application to anything I do as an English professor. Another problem was that it quickly became clear that there was a huge overlap between the fields of knowledge/information theory and cognitive science. So the question became how to make this reading useful to myself, to this project and to anyone else who might read this project.

First, I read a number of survey texts which explained both the history of cognitive science as well as outlined its application in its various fields: particularly

Gardner's *The Mind's New Science: A History of the Cognitive Revolution* and Lakoff and Johnson's *Philosophy in the Flesh: The Embodied Mind and Its Challenge to Western Thought*. At the same time I was reading two associated texts: Turner's *The Literary Mind: The Origins of Thought and Language* for ToM and another book loaned to me by a friend, Kandel's *In Search of Memory: The Emergence of a New Science of Memory*.

It was Kandel's book, a history of developments in cognitive science written as a memoir that was the breakthrough text for me. While the other texts were overwhelming either in the sheer amount of information or in their technicality, Kandel made the developments of cognitive science not only clear, but also compelling. That is when I realized that I needed to turn to more popular or lay accounts in order to understand the developments and significance of this field. At that point, I also realized that much of what I had read for knowledge theory, Gladwell, Pink, etc was applicable here. They too were explaining much of cognitive science but in clear and compelling ways. And finally, as I read more of Howard Gardner, perhaps the best known popularizer of cognitive science for education and pedagogy, I realized how useful cognitive science could be to what I do.

So, again, most of my reading was not what I initially envisioned, but it did begin to dovetail nicely with what I was discovering in my reading in knowledge theory and in information literacy. The consistent message throughout was in the need for higher order thinking skills, metacognition, in the pursuit of understanding.

As I turned to the survey process, I suspected that, like me, few of my colleagues were familiar with information technology or the developments in the field of cognitive science. And that proved to be the case. Most English departments are like ours, information literacy may be available but most of us don't know about it. Most colleges and universities do offer information literacy through their libraries, but it seems that unless the school has made a concerted effort to require information literacy as specific competency, the emphasis is scattered. I don't really find this surprising as the one thing I learned this year was how little I knew about much of this. Most of us are struggling to keep up with our classes, our grading and, developments in our own field, let alone developments which seem to belong to other fields. And of course, one consistent message underlying all of my reading this year was the sheer speed with which all this has taken place. Few of us can keep up with it all. And so most English departments have continued to do what they have always done. That does mean teaching research as a process, which we all view as an essential skill; but I think what none of us are clear about is just how much more time and practice spent on the thinking skills underlying the research process we need to incorporate into our curriculum

I should also point out that I did not specifically ask which documentation/citation system individual English departments used as I assumed (correctly) that it was the MLA citation system. But there has been an interesting thread on one of my academic listservs over the summer about whether we should even be teaching the MLA system anymore. Most scholarship follows the Chicago style – in fact, both my dissertation and all my publications have required Chicago style. In other words, though I teach the MLA system, I have never used it in a professional capacity. And it is clear from the listserv

discussion, neither have my colleagues. The discussion quickly segued from whether we should teach MLA or Chicago to whether we should be teaching citation systems at all. After all, not only are specific software programs available that will correctly format an essay, almost all word-processing programs do the same thing as well. Shouldn't we be teaching the principles underlying the need for citation, rather than focus on the ever-changing rules themselves? Obviously I found this discussion fascinating as it simply made explicit what I was already thinking about the teaching of research in English departments. Rather than focusing on the clearly necessary skills of processing and understanding information, all too often we have focused on the more administrative skill of citing information. Clearly, the whole discipline needs to reconsider its approach.

So finally, based on this year's study and research, what we all need to do is rethink our own emphases in the classroom. As I discuss in my conclusions section, it is vital to emphasize the development of metacognition and understanding across disciplinary lines. In order to do that, there will have to be changes of emphasis, time, and approach. Most of all, there has to be a better understanding on all our parts of the world we are facing together, not as separate and discrete generations. In other words, we all need more understanding of ourselves and each other.

I would like to close this narrative report with the observations I made only a few weeks ago after seeing the movie *Julie and Julia*. I had read both memoirs when they were first published and was anticipating what proved to be an excellent movie. But there was much media discussion afterward about the difference between the two women; many commentators were shocked at the revelation in the movie that Julia Child did not like Julia Powell's blog about attempting to make every recipe in Child's *Mastering the*

Art of French Cooking in one year. She viewed Powell and her project as unserious – the ultimate critique for Child. But for me Child's critique is very reminiscent of professor's complaints about their students and their students' approach to learning. In many ways, this is a demonstration of the divide between today's professor and today's student; they both do the work, but their different approaches represent the divide of the digital age. Child is an exemplar of what Malcolm Gladwell calls an outlier. She spent ten years of diligent practice, quite literally mastering the art of French cooking by following the time-honored Aristotelian practices for knowledge acquisition. As a result, although revolutionary in its content, its organization and its pictorial approach, her tome is thick, detailed and dense. Powell's reflects the blogging culture; her emphasis on constant reinforcement and feedback, her emotional first-person based approach, stands in direct contrast to Child's. But rather than being unserious, Powell's book and attitude simply reflect the realities of our time and of those whom Marc Prensky classifies as digital natives: "today's students think and process information fundamentally differently from their predecessors. These differences go far further and deeper than most educators suspect or realize." What we have to remember that different is not better or worse, serious or unserious; it's just different.

Benefit and Value to College

As should be clear from this project, my study of knowledge theory, information literacy and cognitive science, covered a body of research that affects everyone at our college, not just me individually or as a department member. The ability to process, analyze, synthesize and above all understand information is an essential skill for us as well as for our students. It is also clear that this will become of increasing rather than decreasing value in the years to come. So the question becomes, as educators, how can we better prepare our students for a constantly changing future, whether of technology, of career, or of information? Certainly we already have an information literacy component through the Mt. SAC library. Our continuing concerns with basic skills also encompasses much of this territory. SLO's and learning objectives all include these concepts as important educational outcomes. In many ways, we are already committed to these values. But the one overriding ideal that became clear in my study this year is that we cannot stop incorporating new changes and new information into our understanding of how best to educate our students as thoughtful, life-long learners whose goal is to create understanding and meaning. I hope that this study is one component that will further that pursuit.

Benefit and Value for Professional Development

As should be clear from my Narrative Report, this project was an exciting intellectual challenge. I did not realize how much there was to learn about any of these fields, nor how they would connect in surprising ways to my field of specialization. Perhaps most significantly, it is forcing me to reassess the structure of my composition and survey courses to try to incorporate the important lessons I learned from this project. That is a task which will take some time, thought and effort, but I look forward to reinvigorated and, hopefully, more effective teaching and learning.

Table of Contents for Sabbatical Project

The Information Age, the Knowledge Revolution and the Crisis of Understanding

The greatest crisis facing modern civilization is going to be how to transform information into structured knowledge. – Carlos Fuentes

I. What exactly is the Knowledge Revolution?

While the idea that we are living in a time, the Information Age, of an ever-increasing stream of information carried by a current of new technologies seems new and distinctly modern, the problem of how to *structure* and *understand* new information is one that has been problematic throughout human history. The issues of literacy, documentation, the storage and processing of information and the understanding of that information are central to human history; furthermore, they have always been linked to the concept of revolution and the revolutionary.

Writing, documentation, and the problem of how to organize and process new information and information technologies actually began around 3000 BCE. At this time, the booming economy of ancient Sumeria led to a technological innovation driven by necessity: writing and written records. Drawing on other recent technological innovations like drawing and counting, merchants, tradesmen, and others began using marks embossed on clay tablets to keep track of transactions. Eventually as trade and commerce expanded, the sheer volume of texts and tablets in the ancient world of the Middle East required an organizational method; early bibliographic records have been found both in

ancient Elba and in the ancient Hittite site of Hattatus. In fact, the records found at Hattatus include lists of author and subject, rudimentary colophons (publication details), even a primitive form of abstract – all the hallmarks of a contemporary library catalogue.

Any large volume of records also requires a storage space: the original libraries were the Sumerian temple libraries. But libraries, in the sense which we understand them, originated with the Babylonian empire. As they supplanted the Sumerian empire, part of the Babylonian enterprise became to preserve the heritage of the past as a form of cultural capital and prestige; so they preserved not only their own texts, but those of the Sumerian past. In fact, they created a bilingual system with Babylonian as the standard dialect and ancient Sumerian for written texts of importance. This connection between preserving the written past as a symbol of political prestige and power is another key component in the development of literacy and information. In the seventh century BCE, when King Ashurbanipal took over control the Mesopotamian empire, he sent scribes to seize every tablet they could find; eventually the Royal Library at Nineveh held over 25,000 tablets. There is little fundamental difference between this story and that of the British Library which currently holds over 14 million books, many of them "acquired" during the reign of the British Empire; the slogan of the British Library is "Explore the World's Knowledge" although that exploration is actually limited to scholars and students who receive approval to consult the library's collections. As Alex Wright asserts,

> The advent of writing and bookmaking has invariably been accompanied by violence and political turmoil…the violent history of libraries is a mirror of empire building: hierarchical systems emerging from violent political upheavals, only to collapse, disintegrate, and give rise to new,

> emergent systems. … From ancient Sumer to India to China to the Aztec kingdom, the same pattern manifested again and again: first came literacy, then the nation-state, the empire, and ultimately, the intellectual apotheosis of the empire, the library. When empires fall, they usually take their libraries with them.[1]

The great libraries of the ancient world were founded by empire builders. Ptolomy I established the library at Alexandria around 300 BCE; when Julius Caesar first visited Alexandria in 47 BCE, the library contained 700,000 volumes making it the largest library for the next thousand years. Caesar went on to found the first public library in Rome and eventually there were public libraries throughout the Roman Empire. The monastic libraries of the Roman Catholic Church helped literacy and the written record survive the Middle Ages in Eurpoe. Finally, it was the libraries of the Islamic empire, in Baghdad, Cairo and Cordova, that maintained the document record of the classical past for the future.

However, for most of the classical and medieval periods, books were few and far between outside such libraries and bibliographic centers, so knowledge was most often stored in the human brain itself. Before the advent of print culture in the fifteenth and sixteenth centuries with its ready access to paper and the printing press, the available technologies – papyrus, parchment and vellum – were all too expensive, too difficult and too delicate from a production standpoint to readily store knowledge. So from the classical period on, complex mnemonic systems were constructed and passed on via

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[1] Alex Wright, *Glut: Information Through the Ages* (Washington D.C.: Joseph Henry Press, 2007): 56-7.

schools, monasteries, and in the few textbooks which did exist. These systems were fundamental rhetorical tools throughout the classical and medieval periods; the *ars memorativa*, or arts of memory, allowed for information storage but, even more so, they provided a way to understand that information.

Such mnemotechnical systems were used either to remember concepts and ideas (*memoria rerum*) or, less often and arguably less usefully, for word-by-word memorization of texts (*memoria verbum*). The invention of the first mnemonic information system is attributed to the ancient Greek poet and philosopher, Simonides of Ceos, who was able to identify the participants of a dinner party after the roof collapsed and crushed them; Simonides could remember each participant by re-creating the image of the party in his mind and "seeing" where each individual had been seated. In other words, he linked a place (*loci*) to an idea/image (*rerum*). The Roman rhetorical manual, *Rhetorica ad Herennium*, was the first explicit rendering of this memory technique, but in the classical period, similar principles were also outlined in Cicero's *De oratore* and in Quintilian's *Institutio Oratoria*. Such techniques were important for everyone from lawyers and politicians to schoolchildren. Since knowledge continued to be memory-based and not text-based during the Middle Ages, medieval pedagogy was designed to develop and train the memories of students so that they would carry their own "library" of ideas within their minds. In his *Confessions*, St. Augustine alludes to the "treasure house" of memory (*ubi sunt thesauri innumerabilium imaginum;* 10.8) that his mind can access. Literary metaphors for this kind of mnemonic device are commonplace in medieval texts and include images of a storehouse (*thesaurus*), a book of memory that can be read page by page in the mind, buildings, libraries, storerooms or cellars, birds,

bees, meadows, pearls, a money pouch (*sacculus*), a cave or inner room, and a chest (*arca*).[2]

More important than whatever metaphor chosen was the systemic organization created by these devices. As scholar Mary Carruthers suggests, these metaphors "center upon the notion of a *designed* memory as the inventory of all experiential knowledge."[3] This conception of a "designed memory" meant that these systems were viewed as ways to store knowledge in order to produce new knowledge, and as well for intellectual and ethical guidance. Carruthers draws a parallel between the functioning of the medieval system of designed memory and the contemporary computer:

> I must ask my readers … to conceive of memory not only as "rote," the ability to reproduce something (whether a text, a formula, a list of items, an incident) but as the matrix of a reminiscing cogitation, shuffling and collating "things" sorted in a random-access memory scheme, or set of schemes, a memory *architecture* and library built up during one's lifetime with the express intention that it be used inventively.[4]

So these memory systems worked like an individual database or yes, Google search, accessing the knowledge contained within them. But even more so, such a matrix was used to "invent" ideas, texts, knowledge and even more importantly, meaning and understanding.

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[2] For more on the arts of memory, see Frances Yates, *The Art of Memory* (Chicago: University of Chicago Press, 1966) and Mary Carruthers, *Book of Memory* (Cambridge: Cambridge University Press, 1990).
[3] Carruthers, *Book of Memory*, 34 (emphasis hers).
[4] Mary Carruthers, *The Craft of Tradition: Meditation, Rhetoric and the Making of Images 400-1200* (Cambridge: Cambridge University Press, 1998), 4 (emphasis hers).

The invention of the printing press negated the need for such mnemonic systems; but this technological advance created the same basis for consequence and creation as have current technological advances. In the 1440's, Johannes Gutenberg invented the technology that allowed for a print revolution: moveable type and the printing press. But this technology was concurrent with other forces that also influenced this important change in information history. The late Middle Ages, the thirteenth through fifteenth centuries ,saw not only a rising level of literacy, but social changes which increased demand for secular texts and economic changes which required more and more documentation. The invention of paper, the availability of scribes for hire, the increasing need for business and government documents, and the growing demand for secular entertainment all occurred before Gutenberg's invention of the printing press so once the technology appeared, expansion was inevitable. As Alex Wright puts it, "even before Gutenberg invented his press, a medieval information explosion was underway, and it would prove literally revolutionary."[5]

Another technological advance was the standardization of typefaces "which would prove the catalytic event in the subsequent movement of information across cultures… a universally recognized standard that speeds the flow of information across a distant network of readers and writers."[6] (As someone with experience of reading medieval manuscripts, I can readily concur with this statement). Another form of standardization occurred at this time, with the establishment of conventions like title pages and colophons. In fact, the form and function of today's book is remarkably similar

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[5] Wright, 109.
[6] Wright, 113.

to the book as it first appeared in the late fifteenth century. These products of the printing press were enthusiastically received across the social spectrum, by the Catholic Church, European governments, scholars, businessmen and the secular public: "by 1500 Gutenberg and his professional descendants had already published an estimated 8 million books; by the end of the sixteenth century the number stood closer to 200 million."[7]

However, the printing press and cheap paper themselves did not solve the need for ways in which to process and understand the information they contained (any more than the invention of the computer has). After all, not only is the systemic storage of knowledge is important, so is the systemic organization of that. We have already seen attempts to organize large bodies of documents from records in ancient Mesopotamia. Aristotle, among many others, attempted to find ways to organize his book collection, but it was Callimachus, the poet and librarian of the great Alexandrian library, who was the first to attempt to catalog, at least in part, a library collection. But with the advent of print culture, two key issues developed: how to classify the information books contained and how to classify the books themselves.

The idea of an information explosion is, again, not a new one. Between 1500 and 1600, European publishers produced almost 200 million books, comprising some 150-200,000 titles.[8] And the numbers would simply continue to increase as they have done until the present day. And as it is for us, the problem of how to organize, access and classify the information within all these texts was problematic. One solution originated in the seventeenth century: the encyclopedia. The encyclopedia constituted " a new literary

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[7] Wright, 115.
[8] Wright, 143.

technology that promised to help its readers cope with a surging tide of new information."[9] Denis Diderot published his *Encyclopédie ou Dictionnaire Raisonné des Sciences, des Arts et des Métiers* over the years 1751-1771. This compendium of organized and synthesized knowledge, containing over 72,000 entries by group of 160 contributors, allowed for ease of use and understanding. It was also revolutionary in that it placed everyday, "low brow" information besides academic and scientific information. So the encyclopedia was truly democratic in its presentation of knowledge; nor is it coincidental that it was published in the years immediately preceding the French Revolution. Of course there were many critics of such a system, and the controversy surrounding Diderot's encyclopedia is very similar to the controversies surrounding today's Wikipedia.

The question of how to organize information was also of increasing importance as the number of books continued to rise. It was another professional class, librarians, who solved the problem during the nineteenth century. In England, Anthony Panizzi the librarian for the British Museum Library (now the British Library) and John dewey and Charles Cutter in America, established the catalog system and organization rules we still use today. We may access the card catalog via internet now, but the way the library is organized still was established by these three men. And it is still true today that librarians take the lead in organizing and processing information as will see in the section on information literacy.

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[9] Wright, 143.

By the mid-twentieth century, we had entered yet another transition and transformation in the history of knowledge. With the advent of computer technology, much more knowledge could be generated, communicated and stored. However, this led to a feeling of confusion called variously information anxiety, data smog and overwhelm. Various methods were attempted but the most important development of the twentieth century was the invention of the World Wide Web in 1989 by Tim Berners-Lee.

The internet itself was invented before the World Wide Web (WWW); the U.S. Department of Defense funded its development in the late 1960's as a form of military communication. The next development was the NSFNet,created by National Science Foundation in 1985 to allow communication among colleges and universities; other countries funded similar systems. While the system was eventually opened to the public, without military access or specialized technical knowledge, the average person was unable to take advantage. While the idea of a networked communication system was pursued by many scientists and thinkers in the twentieth century, it's Berner-Lee's simple yet sophisticated invention that has caused the latest knowledge revolution. Many consider the invention of the WWW on par with Gutenberg's invention of the printing press: certainly the global reach of the internet is evidence for such a statement. As of February 2006 it was estimated that 1.2 billion people had accessed the internet via the WWW at least once. Of course there was still the problem of how to try to organize or even find information on such a large and sprawling system, so the search engine arose to address the need. The first search engine to become widely popular was Yahoo, invented in 1994 by two Stanford graduate students. Although there were rival search engines,Yahoo would not be supplanted in the popular imagination until the rise of

Google in 2000. Google will probably be supplanted in its turn but its vision to be a center for all knowledge probably best represented by Google Scholar which aims to digitize as many academic publications as it can; thus allowing anyone to engage in research whether they have physical access to an academic library or not. (As someone who had to use microfilm and microfiche, I can only applaud this latest innovation).

There is no real way to comprehend the changes these digital innovations will bring to our world anymore than those living in the decades immediately following the invention of the printing press could begin to imagine what the world would become. Along with the cell phone, the internet allows unprecedented access, speed and reach to information and other people. Already "the Web has forced dramatic transformations inside many corporations, posed challenges to the authority of the press, and completely transformed the way many people interact. Old fixed systems like library catalogs, controlled vocabularies, and manual indexes seem increasingly problematic in the digital age; new fluid systems like Web search engines and collaborative filtering tools seem to be displacing them."[10] So the question becomes not whether change is next, but what change is next and how to both anticipate and adapt to it.

The question of how to approach the future alongside the idea of the long reach of the past as substructure is a central principle of the Long Now Foundation. Created by a group of scientists, journalists, engineers and others in 1996 (or 01996 as they would have it) to combat what they saw as the danger of the "faster/cheaper" mind set, it promotes "slower/better" thinking. The writer and inventor, Stewart Brand, explains in

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[10] Wright, 225-6.

his book, *The Clock of the Long Now*, that the Long Now places us "where we belong, neither at the end of history nor at the beginning, but in the thick of it."[11] The Long Now is a 20,000 year period: beginning with the year 02000, it stretches 10,000 years back into the past to 8,000 BCE while also stretching 10,000 years forward into the future to 12,000 CE. The Long Now proposes six sub-layers of civilization, with the higher, faster layers (Fashion, Commerce) as the source of innovation and the lower, slower layers, like Infrastructure and Culture, providing stabilization and continuity. The goal of the Long Now project is to create the "seed of a very long term cultural institution"; while science and education have their place as Intellectual Infrastructure, it is the penultimate sublayer, Culture, where the Long Now truly "operates," moving at the pace of "language and religion."[12] One of the Long Now's guidelines includes to Serve the Long View by taking into account past and future in its vision of the present. Part of the foundation's mission is to document the Long Now in part through the creation of the Long Now Library, based on the models of the library at Alexandria and the libraries maintained at medieval monasteries. In other words, we have arrived where we began.

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[11] Stewart Brand, *The Clock of the Long Now: Time and Responsibility*, New York: Basic Books, 1999, 31.
[12] Brand, 38.

II. What exactly is the Information Age?

The digital age could be said to have begin in the 1890's with the invention of the punchcard as one form of data for what was known as a "business machine." But it was the needs of the military during WWII and, amazingly enough, the Census Bureau immediately after the war that opened up the field to innovation and evolution. Companies such as Sperry-Rand, Control Data, Digital Equipment Corporation and, of course, International Business Machine led the mid-twentieth century development of the computer. Historian Theodore Roszak defines a computer as "a device that remembers what it counts, counts what it remembers, and retrieves whatever has been filed away at the touch of a button."[13] The first computer to register in the popular mind was UNIVAC, the first stored-program computer. While used mainly for business data services, the American public was introduced to UNIVAC during the 1952 presidential elections. CBS borrowed the computer to use for polling predictions; famously, the computer correctly predicted the outcome of the election based on only 5-7% of the popular vote. The computer's prediction, Eisenhower winning by a landslide, went against the opinion of CBS experts, so the computer's prediction was initially ignored. Eventually, the pundits had to concede to the computer. In 1970, Xerox Corporation established a research lab in Palo Alto, California, knows as PARC (Palo Alto Research Center). PARC would go on to invent laser printing, the Ethernet, GUI or graphical user interface, and most importantly, the personal workstation, the forerunner of the personal computer. Almost everything the average computer user encounters today – from the mouse to WYSIWYG

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[13] Roszak, *The Cult of Information: The Folklore of Computers and the True Art of Thinking* (New York: Pantheon, 1986): 6.

formatting – was invented, or inspired, by PARC research.

But information theory is separate from computer science. In 1950, scientist Claude Shannon published his seminal article, "A Mathematical Theory of Communications," which established the discipline of information theory. Shannon's work signaled a paradigm shift in the definition and use of the term "information." Information is now seen as a quantitative entity, able to be coded and decoded, and the key factor in information theory is how this entity is to be communicated and exchanged. Roszak explains that "in his [Shannon's] paper, the fundamental concepts of information theory – noise, redundancy, entropy – are rounded up into a systematic mathematical presentation. Here, too, the 'bit,' the binary digit basic to all data processing, first appears to take its place as the quantum of information."[14] In fact, the development of information science is an excellent example of a scientific revolution, or paradigm shift, as outlined by the historian of science, Thomas Kuhn in his *The Structure of Scientific Revolutions*. According to Kuhn, a scientific revolution is marked by a paradigm shift: in this instance, the transformation of the conception of information itself. The corollary development has been the number of new ways in which to transfer or communicate that information. This, in a nutshell, is the most basic definition for the term Information Revolution. However, as Roszak is at pains to point out, this new model viewed information as a unit of code to be transmitted and exchanged, yet it is divorced from any meaning that unit or code might contain. Regardless, as a field, information theory has not only been successful, as we have already seen from the previous section, inventions like the WWW and the search engine have already revolutionized the world we live in.

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[14] Roszak, 12.

This paradigm shift has led to other new fields, including artifical intelligence (which, as we will see, is also related to cognitive science). In 1948, mathmetician Norbert Wiener published *Cybernetics*, coining the term "cybernation." Weiner argued that the "in perfecting feedback and the means of rapid data manipulation, the science of cybernetics was gaining a deeper understanding of life itself as being, at its core, the processing of information."[15] Weiner's ideas led to the development of the field of AI, artificial intelligence, which is concerned with the development of the computer's ability to think for itself. In many ways, this is the most controversial part of the digital era since in many minds, these scientists seem to be seeking to replace human cognition with computer cognition. At best, this will result in the evolution of human beings into cyborgs (combination of machine/human) or, at worst, this field fuels plenty of material for horror and science fiction movies in which the computers take over and destroy mankind (i.e.*The Terminator* saga, *The Matrix* saga).

But in reality, for the non-computer scientist, the Information Revolution is experienced as the developments and consequences stemming from the discoveries of information theory, rather than the conceptions underlying information theory itself. So the question remains, how do we adapt and thrive in the midst of such technological and cognitive change?

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[15] Roszak, 9.

III. What exactly is a Knowledge Worker and Knowledge Work?

The origins of written knowledge in ancient Sumeria led to the rise of a new profession, the scribe, who could be said to be the original knowledge worker. The scribes came to constitute a professional class of their own, a social and economic institution, as the need for their skills grew ever greater over the next 2500 years. Scholar Walter J. Ong has traced this pattern of transition from orality to literacy across other cultures and civilizations: initially spurred by commerce, the need for writing and documentation leads to a period of "craft literacy" where "writing is a trade practice by craftsmen, whom others hire to write a letter or document as they might hire a stone-mason to build a house, or a shipwright to build a boat."[16] Scribes would be a dominant professional class until the advent of the printing press.

That invention gave rise to yet another influential professional class, or knowledge worker, the librarian. Like the scribe, the librarian, as we have already seen, dates back to the very beginnings of literacy. They have played an important role in the story of knowledge. The ways in which we still organize information, collections of texts, libraries etc. were all created by librarians. And as we will see, they have taken the lead in the field of information literacy. The men and women who ran the punchcards and other early forms of computers technology as well as the creators of those systems could also be called knowledge workers. Today the rise of information theory has also led to those known as information architects, like Wurman and Wright, who structure information in new and different ways.

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[16] Walter J. Ong, *Orality and Literacy: The Technologizing of the Word* (New York: Routledge, 1988): 94.

But today the term "knowledge worker" constitutes a specific kind of employee and a specific kind of work. Actually few of us realize today that the term "knowledge worker" was first coined in 1959 by Peter Drucker in *Landmarks of Tomorrow*. Drucker continued to develop this concept of contemporary employment even though the use of this term would not become a commonplace until the digital era. He defined the worker of the future as "one who works primarily with information or … develops and uses knowledge in the workplace."[17] Because the worker's value lies in their knowledge rather than their physical labor, Drucker argues that employees should be seen as assets to be encouraged and valued, rather than cogs in the wheel or interchangeable parts with little to contribute. By 2008, an updated version of the concept, the "knowledge worker 2.0," was created to indicate the evolution of the initial concept: "The focus is pretty much on the subject of people… And like we all know, a successful KM (Knowledge Management) strategy is one that combines into perfect balance a focus on the people, on the tools and on the processes."[18] In other words, anyone who handles information, communication and interpersonal communication rather than tools is a knowledge worker – in a sense, we are all knowledge workers.

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[17] Peter Drucker, Landmarks of Tomorrow: a Report on the New "Post-Modern" World 1959
[18] Qted. in "Knowledge Worker 2.0 – Power to the People." <http://www.slideshare.net/trib/knowledge-worker-20>.

III. What are the consequences of the Knowledge Revolution and the Information Age?

There is a persistent theme among many of the major thinkers within the realm of knowledge theory: that there is a profound difference between information and understanding. As they all elucidate, the simple fact that you have information does not therefore mean that you understand it, or can create meaning from/with it. For instance, Theodore Roszak calls this period the Cult of Information. As Roszak asserts: "The burden of my argument is to insist that there is a vital distinction between what machines do when they process information and what minds do when they think."[19] Later he asserts that those who proselytize for the computer future, lose sight of the fact that " *the mind thinks with ideas, not with information.*"[20] Howard Reingold says of innovative computer scientist, J. C. R. Licklider that

> The idea of building a mathematical or electronic model was meant to *simplify* the task of understanding the complexities of the brain, like plotting a graph to see the key relationships in a collection of data. But the models themselves now began to grow unmanageably complex. …which left less time for what he considered to be his primary occupation – thinking about what all that information meant. Beneath those numbers and graphs was his real objective – the theoretical underpinnings of human communication.[21]

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[19] Roszak, xi.
[20] Roszak, 88 (italics his).
[21] Howard Reingold, *Tools for Thought: The History and Future of Mind-Expanding Technology* (New York: Simon and Schuster, 1985): Ch. 7.

Knowledge "work" or "knowledge theory" coupled as it is with the both the digital and information revolutions has become a concern in business over the past fifty years. However, that concern, or interest, has not necessarily kept pace in higher education although it is of vital importance to the education we provide our students regardless of our disciplinary focus. In fact, as Peter Drucker has argued, such concerns are central across disciplines. In fact he goes as far as to argue that business is in fact a liberal art:

> Management also deals with people, their values, their growth and development – and this makes it a humanity … management is deeply involved in moral concerns – the nature of man, good and evil. Management is thus what tradition used to call a liberal art – "liberal" because it deals with the fundamentals of knowledge, self-knowledge, wisdom and leadership; "art" because it is also concerned with practice and application. Managers draw on all the knowledges and insights of the humanities and the social sciences – on psychology and philosophy, on economics and history, on ethics – as well as on the physical sciences. But they have to focus on this knowledge on effectiveness and results – on healing a sick patient, teaching a student, building a bridge, designing and selling a "user-friendly" software program. For these reasons, management will increasingly be the discipline and the practice through which the "humanities" will again acquire recognition, impact and relevance." (12-3)

All of these developments have profoundly changed the intellectual and educational landscape that we, and our students, inhabit. How do we teach students to use new technologies, to research information in an ever-expanding universe of ideas, and to understand and articulate that new knowledge in useful ways? The field of knowledge work has developed to answer just such questions in both the workplace and the classroom.

IV. Who exactly are our students, these knowledge workers of the future?

All too often the 75 million members of what is variously known as Generation Y, the Millennials, the Echo Boomers, the Net Generation, Digital Natives are stereotyped as slackers, self-centered progeny of helicopter parents, disinterested in and uninformed about the world outside themselves. However, Intuit Inc.'s 2008 Future of Small Business Report describes this generation of students as "tech-savvy innovators who can effortlessly multi-task and network, as well as showing out-of-the-box creativity and a deep desire to learn new things."[22] Pollster John Zogby, who defines the current college-age population, born 1979-90, as First Global, agrees, claiming that First Globals have been misunderstood by pollsters and pundits as slackers. Instead, he asserts that they are "ready to go anywhere, experience everything, and work and live in exotic places; and they pillage cyberspace for information that will allow them to do all these things."[23] Zogby contends that "whatever their factual base of knowledge, members of this

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[22] Shelly Banjo, "A Perfect Match?" *Wall Street Journal* 13 Oct 2008: R9.
[23] John Zogby, *The Way We'll Be: The Zogby Report on the Transformation of the American Dream* (New York: Random House, 2008): 215.

generation are more networked and globally engaged than members of any similar age cohort in American history. That's a sweeping statement but I stand by it."[24]

Professor Larry Braskamp has defined "this generation's college students as the 3M mix—Millennial, Postmodern NeXter, and Missionary." Millennial students "are conventional, cooperative team players, optimistic about the future, interested in math and science, prefer secure and regulated environments, accept responsibility, respectful of social norms, engage in community projects, and are concerned about their future... They focus on grades and performance, rely on peer approval, and prefer to not be involved in reflective and critical thinking." Postmodern NeXters "like instant gratification, have a short event horizon, seek excellence-without effort, [are] skeptical about life, intellectually disengaged, adaptable and pragmatic, entitlement focused, and are often stressed about their life." Missionary students are "evangelical in their worldview, believe in external authority of truth and wisdom, hold traditional views of family and social interactions, are serious in their studies and work, view life and work as a calling and vocation, and are politically and socially conservative. Many, however, can be called "countercultural conservatives" given their support of equal rights, gun control, and social justice." All are close to their parents. Braskamp sees these descriptions as representing "clusters" of students and most students will fall into one or more clusters. [25]

Mark Prensky defines today's college students as "Digital Natives" comfortable with technological information and change, in sharp contrast to their instructors who he terms as Digital Immigrants. Prensky argues that "It is amazing to me how in all the

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[24] Zogby 94.
[25] Larry Braskamp, "Three Central Questions Worth Asking," Journal of College and Character 9.1 (2007): 1-7. http://collegevalues.org.

hoopla and debate these days about the decline of education in the US we ignore the most fundamental of its causes. *Our students have changed radically. Today's students are no longer the people our educational system was designed to teach.*"[26] Prensky's argument focuses not only on how different our students are, but how we have to work with them and their existing skills to get them to effectively learn. His research has included developing video games that use the skills students are familiar with in order to learn new information. While Prensky's message is disconcerting, and his methods seem far too radical for many professors, what he has to say is important. We should be meeting our students where they are, recognizing what they can do, so that we can help them to do more, know more and understand more. Finally, the following observation from the *Wall Street Journal* reminds us how negative stereotypes have unfairly marked our students as ignorant or uninterested in learning, "Gen Y employees tend to remain at companies longer if they are constantly learning portable – and varied – skills, says Ms. Brown, the consultant. They 'love learning and feeling like they are getting exposure' to the entire company."[27] So our students do love to learn; but they view information and learning through a new lens, one we need to learn as well.

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[26] Mark Prensky, "Digital Native, Digital Immigrants," *On the Horizon* 9.5 (2001): 1, italics his.
[27] Banjo, R9.

Annotated Bibliography

Brand, Stewart. *The Clock of the Long Now: Time and Responsibility*. New York: Basic Books, 1999.

Fascinating discussion that takes the long view of history and how to consider a future that extends long past our present. Also see the website for more information.

Prensky, Mark. "Digital Natives, Digital Immigrants." *On the Horizon* 9.5 (October 2001). <http://www.marcprensky.com/writing/default.asp>.

Prensky, Mark. "Digital Natives, Digital Immigrants Part II – Do They Really Think Differently?" *On the Horizon* 9.6 (October2001). <http://www.marcprensky.com/writing/default.asp>.

Prensky can be harsh and antagonistic but his consideration of who our students actually are and what they can do is important. Also see his website for many, many more articles and sources.

Roszak, Theodore. *The Cult of Information: The Folklore of Computers and the True Art of Thinking*. New York: Pantheon, 1986.

While certainly, some of this book is outdated – especially in terms of changes wrought by the internet and email – the surprising thing is how acute and accurate Roszak's assessment is of the consequences of the digital age. Highly recommended despite its age.

Information Literacy and the Struggle to Understand Information

To be information literate, a person must be able to recognize when information is needed and have the ability to locate, evaluate and effectively use the needed information.[1]

As we have already seen, literacy has always been driven by technological advances and by the need to systemically store and organize texts. While contemporary sources of information have changed, the ability to process large amounts of information is a problem that has been with us since the very beginnings of literacy. Information literacy is the latest evolution in the history of literacy.

The term "information literacy" was coined by the president of the Information Industry Association, Paul Zurkowsi, in his 1974 proposal for the National Commission on Libraries and Information Science. He stated that

> People trained in the application of information resources to their work can be called information literates. They have learned techniques and skills for utilizing the wide range of information tools as well as primary sources in molding information-solutions to their problems.[2]

Others in the 1970s continued to expand the definition to include the idea that these were new skills and, furthermore, skills essential to making "more intelligent decisions than

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[1] American Library Association Presidential Committee on Information Literacy, *Final Report*, 1.

[2] Qtd. in Michael B. Eisenberg, Carrie A. Lowe, and Kathleen Spitzer, *Information Literacy: Essential Skills for the Information Age* 2nd ed. (Westport, CT: Libraries Unlimited, 2004): 3.

citizens who are information illiterates."[3] The technological advances in the 1980's furthered the definition culminating in the American Library Association's 1989 definition: "To be information literate, a person must be able to recognize when information is needed and have the ability to locate, evaluate and effectively use the needed information."[4] The committee further defined the informationally literate as:

> Ultimately, information literate people are those who have learned how to learn. They know how to learn because they know how knowledge is organized, how to find information, and how to use information in such a way that others can learn from them. They are people prepared for lifelong learning, because they can always find the information needed for any task or decision at hand.[5]

In 1992, C. S. Doyle published the results of a Delphi study that further expanded the definition of information literacy to include:

- Recognizes that accurate and complete information is the basis for intelligent decision making
- Recognizes the need for information
- Formulates questions based on informative needs
- Identifies potential sources of information
- Develops successful search strategies

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[3] M.R. Owens qtd. in Eisenberg, Lowe and Spitzer, 3.
[4] ALAPCIL, *Final Report.*
[5] ALAPCIL, *Final Report.*

- Accesses sources of information including computer-based and other technologies
- Evaluates information
- Organizes information for practical application
- Integrates new information into an existing body of knowledge
- Uses information in critical thinking and problem solving[6]

This extensive list became the template for later expansions and refinements of the definition of information literacy. In addition, other literacies have been added to the list of competencies as technology has continued to develop. Those include visual literacy, media literacy, computer literacy, digital literacy, and network literacy.

Various researchers in information literacy have developed models for the teaching of information literacy. Carol C. Kuhlthau has extensively researched the impact of various approaches on students and student learning; her work examines the ISP (information search process) from the student's perspective. Her work, based in part on cognitive science, considers the issue of uncertainty – how confusion and anxiety affect the research process. She argues that not enough literacy models take into account the negative affect that uncertainty and confusion play in the research process:

> This research is unique in that it goes beyond the cognitive aspects of information seeking to examine the feelings users commonly experience. … The whole experience of users affects their information use, their feelings as

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[6] Doyle qtd. in Eisenberg, Lowe and Spitzer, 4.

> well as their intellect, particularly in the exploration stage. By neglecting to address affective aspects, information specialists are overlooking one of the main elements driving information use. [7]

Kuhlthau has developed models such as Guided Inquiry to emphasize the importance of creating a focus to the process that allows for control and interest during the information search process and keeps the individual from becoming overwhelmed by their uncertainty and anxiety. Other models such as the Big6 have been more dominant in elementary and secondary education but I found Kuhlthau's model to be the most useful in our context since her conclusions, and her model, are derived from her research with college students. Ultimately, Kuhlthau and the other information literacy theorists see information literacy as a significant part of the life-long learning process; in other words, these skills will be essential not only in an educational context, but throughout a student's life.

The current definition of information literacy by the ACRL, the Association of College and Research Libraries, builds on the initial 1989 definition:

> Information literacy forms the basis for lifelong learning. It is common to all disciplines, to all learning environments, and to all levels of education. It enables learners to master content and extend their investigations, become more self-directed, and assume greater control over their own learning. An information literate individual is able to:
>
> - Determine the extent of information needed
> - Access the needed information effectively and efficiently

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[7] Carolyn C. Kuhlthau, "Inside the Search Process: Information From the User's Perspective." *Journal of the American Society for Information Science* 42.5 (1991): 370.

- Evaluate information and its sources critically
- Incorporate selected information into one's knowledge base
- Use information effectively to accomplish a specific purpose
- Understand the economic, legal, and social issues surrounding the use of information, and access and use information ethically and legally.[8]

The importance of information literacy is clear from these final components. Information literacy is far more that the ability to find information, the informationally literate person must also be able to understand the information and derive meaning and judgment from it. Finally the ACRL definition warns that:

> Because of the escalating complexity of this environment, individuals are faced with diverse, abundant information choices--in their academic studies, in the workplace, and in their personal lives. … these [choices] pose new challenges for individuals in evaluating and understanding [information]. The uncertain quality and expanding quantity of information pose large challenges for society. The sheer abundance of information will not in itself create a more informed citizenry without a complementary cluster of abilities necessary to use information effectively.[9]

This is why Jeremy Shapiro and Shelley Hughes have argued, in "Information Literacy as a Liberal Art," that the higher education curriculum should include seven

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[8] ACRL, "Information Literacy Competency Standards for Higher Education," <http://www.ala.org/ala/mgrps/divs/acrl/standards/informationliteracycompetency.cfm >.
[9] ACRL, "Information Literacy Competency Standards for Higher Education," <http://www.ala.org/ala/mgrps/divs/acrl/standards/informationliteracycompetency.cfm >.

dimensions of information literacy. Those seven dimensions incorporate tool, resource, social-structural, research, publishing, emerging technology and critical literacies. Shapiro and Hughes assert that:

> ...information literacy should in fact be conceived more broadly 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 even philosophical context and impact – as essential to the mental framework of the educated information-age citizen as the trivium of basic liberal arts (grammar, logic and rhetoric) was to the educated person in medieval society.[10]

Shapiro and Hughes are right to put information literacy in the historical context of the *trivium*. As we have already seen, the ability to process and understand information is part of the human condition and has been a foundational principle of education, always.

Obviously the issue of information literacy should be at the forefront of our mission as a community college. A recent survey found that there is an ever-increasing demand for information literacy courses at the 2-year level: between fall semester 2006 and fall semester 2007 the number of information literacy classes offered at the 2-year level increased 38%, but only 5% of colleges required such a course to graduate. The discipline of library science has been the main center of information literacy advocacy forefront of information literacy, but such a responsibility should not rest only on the shoulders of the librarians. It is clear that information literacy is not a discipline-specific

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[10] James Shapiro and Shelly Hughes, "Information Literacy as a Liberal Art," *Educom Review* 31.2:1.

component of education, but rather one we must all engage in. As Hughes and Shapiro assert, "defining information literacy broadly, so as to constitute both a liberal as well as a technical art, and turning that definition into a curriculum are major challenges both intellectually and practically, and deserve extended discussion and collaboration among both educators and information-systems professionals, humanists, and computer and information scientists."[11]

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[11] Hughes and Shapiro, 3.

The Cognitive Revolution and Understanding the Mind

I. What exactly is the Cognitive Revolution?

In the latter part of the twentieth century, discoveries in both the behavioral sciences and information/communication sciences led to the development of the field of cognitive science. This cognitive "revolution" is a paradigm shift in the consideration of the nature of human knowledge and intelligence which took place in the fields of behavioral and social sciences during the mid-1950's. So cognitive science, like information theory, follows all the hallmarks of a scientific revolution as outlined by Thomas Kuhn in his *The Structure of Scientific Revolutions*. According to Kuhn, a scientific revolution is marked by a paradigm shift: adherence of acolytes to the newly agreed upon core assumptions and new models, in the process leaving behind older ideas/fields; establishment of organizational structures and works such as learned societies, textbooks, and journals; and establishment of new disciplinary departments within the university structure.

The establishment of cognitive science as a disciplinary field is generally agreed to have occurred at the Symposium on Information Technology held at the Massachusetts Institute of Technology in September 1956. Papers by what would prove to be influential scholars such as computer scientists Allan Newell and Herbert Simon, linguist Noam Chomsky and psychologist George Miller among others indicated a developing intellectual congruence in fields related to communication, information technology and psychology. As George Miller realized,

> I went away from the Symposium with a strong conviction, more intuitive than rational, that human experimental psychology, theoretical linguistics, and computer simulation of cognitive processes were all pieces of a larger whole, and that that future would see progressive elaboration and coordination of their shared concerns.... I have been working toward a cognitive science for about twenty years beginning before I knew what to call it.[1]

But Miller was not the only researcher who had been working toward what would become "cognitive science." Other psychologists such as Jerome Bruner and John Austin were also pursuing similar research. In computer science, John McCarthy, Marvin Minsky, Allen Newell and Herbert Simon were developing what would become the field of artificial intelligence. Gardner also notes that the posthumous book *The Computer and the Brain* by John Neumann, published in 1958, would prove seminal in the development of both computer and cognitive sciences. Besides psychology, linguistics and computer science, developments in neuroscience, anthropology, philosophy and ethology (animal behavior study) all were moving along the same intellectual lines and would all prove intrinsic to the development of cognitive science.

By the 1960's, "governmental and private sources provided significant financial support" in the further development of cognitive science.[2] In 1960, Jerome Bruner and George Miller founded the Center for Cognitive Studies at Harvard University; it would prove to be the epicenter of cognitive research for the next ten years. As Gardner

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[1] Qtd. in Howard Gardner, *The Mind's New Science: A History of the Cognitive Revolution* (New York: Basic, 1995): 29.

[2] Gardner, *The Mind's New Science*, 32.

explains, "The list of visitors to the Center reads like a Who's Who in Cognitive Science: nearly everyone visited at one time or another."[3] The institutionalization of cognitive studies as a science continued with the publication of textbooks in cognitive psychology; perhaps the most influential during this period was *Cognitive Psychology* by Ulric Neisser in 1967. By the 1970's, further institutionalization and organization marked the development of the field. The journal, *Cognitive Science*, was first published in 1977 and the Cognitive Science Society held its first meeting in 1979. The Cognitive Science Society as well as the first department of Cognitive Science were both established at the this time at the University of California, San Diego.

Gardner, still probably the most well-known proponent of cognitive science in the popular imagination, outlines five ideas as being central to cognitive science: two "core assumptions" and three central concepts. The first core assumption is "representation":

> Cognitive science is predicated on the belief that it is legitimate – in fact, necessary – to posit a separate level of analysis which can be called the level of representation. When working at this level, a scientist traffics in such representational entities as symbols, rules, images – the stuff of representation which is found between input and output – and in addition, explores ways in which these representational entities are joined, transformed, or contrasted with one another. This level is necessary in order to explain the variety of human behavior, action and thought.[4]

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[3] Gardner, *The Mind's New Science*, 32.
[4] Gardner, *The Mind's New Science*, 38.

The second core assumption is the centrality of computers both as a model of human thought and as a tool for scientific research. The three central concepts include first, a de-emphasis on the affect of context and culture on human behavior; second, an emphasis on the importance of interdisciplinary studies; and, third, an emphasis on the foundational principles of classical philosophy and epistemology.

Cognitive science is indeed highly interdisciplinary. In fact, the paradigm shift toward cognitive science occurred in six disciplines broadly spread across the humanist, social science and hard science spectrum: philosophy, psychology, artificial intelligence, linguistics, anthropology, and neuroscience. This is another factor that makes cognitive science so revolutionary. While most paradigm shifts take place within an individual discipline and may only later see influence in other disciplinary areas, cognitive science's reach has been broad and highly influential. However, these core assumptions and central concepts do play out differently depending upon disciplinary emphasis. As Gardner notes, this can provide both opportunity and limits to the further development of cognitive science. For instance, as George Lakoff and Mark Johnson argue in *Philosophy in the Flesh*, the logical implications of the three major findings of cognitive science – which they define as the fact that the mind is embodied, thought is mostly unconscious and abstract concepts are metaphorical – imply that there is no Cartesian dualism, or Kantian autonomy, utilitarian drive or poststructural, decentered subject; all observations that throw any discipline based on the principles of Western tradition into question. But Lakoff and Johnson also argue that there is, therefore, no Chomsky-like innate linguistic structure: "rather central aspects of language arise evolutionarily from sensory, motor,

and other neural systems that are present in "lower" animals."[5] In fact, they reject *a priori* reasoning altogether – a stance the discipline of philosophy has not embraced.[6]

The implications of the insights of cognitive science are still being considered both within individual fields and across interdisciplinary boundaries. New models and new ways of perceiving the world continue to emerge from all the subdivisions of cognitive exploration. What is certain is that the insights and controversies prompted by cognitive science will continue to impact all our thinking for many years to come.

II. What is the implication of Cognitive Science for pedagogy?

Because of its interdisciplinary nature, and because of the nature of its field of inquiry – the question of human intelligence itself – the insights of cognitive science affect *all* our disciplinary fields. The question of how we learn – i.e. the essence of pedagogy – is at the center of cognitive science's pursuit of representation. What kinds of representations do humans have? Are they innate or learned? Can they be influenced or changed? Are some more essential than others? As Gardner argues, "most educators are only dimly aware of these changes in the thinking of psychological researchers; and even those who are – perhaps because they read publications like Scientific American – may not translate these new understandings into innovative educational practices."[7] In fact, Gardner himself is probably the most familiar concept of cognitive science for the average educator as his theory of multiple intelligences has found wide play in

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[5] George Lakoff and Mark Johnson, *Philosophy in the Flesh: The Embodied Mind and Its Challenge to Western Thought* (New York: Basic, 1999): 6.
[6] Lakoff and Johnson, Ch. 1.
[7] Gardner, *The Disciplined Mind: What All Students Should Understand* (New York: Simon and Schuster, 1999): 68-9.

educational circles. But Gardner asserts that "the cognitive revolution ushered in a set of new ideas – ideas that I believe, have a powerful educational implications."[8] He outlines six fundamental influences of cognitive science that have already affected us and our pedagogy whether we are aware of their origins in cognitive science or not. The six fundamental influences are:

1. Developmental Perspective: attributed to child psychologist Jean Piaget, this is the idea that children are not simply smaller versions of adults but whole beings with their own ideas, representations and viewpoints which develop as they age.

2. Universal Mental Representation: attributed to the linguist Noam Chomsky, this is the idea that certain, specific representations, particularly those of language, are innate and universal.

3. Different Patterns of Intelligence: attributed to Howard Gardner, this is the idea that human intelligence can be categorized into at least eight separate forms/representations.

4. Pros and Cons of Early Representations: this is the idea that children develop their own very distinctive representations; however, continued belief in such misconceptions, the "unschooled mind," can hinder intellectual development and maturity.

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[8] Gardner, *The Disciplined Mind*, 69.

5. Desirability of Higher Cognitive Functions: this is the idea that metacognition, thinking about one's own thinking, is a vital component of intellectual development and maturity.

6. The Role of Personality, Motivation and Emotion: this is the idea that other factors such as motivation, individual temperament and emotions are all factors which must be considered along with the more representational emphasis of cognition theory. [9]

This list is indeed familiar, and implies that we are all already incorporating insights from the field of cognitive science without necessarily being aware of where that information is coming from. Yet, in so many ways, the insights of cognitive science are all around us. And there is, indeed, a growing interest in many fields to being explicitly applying the insights of cognitive science into our pedagogy. However, as I discovered myself during this study, the field of cognitive science is far too big to understand without a great deal of study; furthermore, much of it is highly technical and specialized, written for the academic reader, not the general reader. Fortunately the insights of cognitive science are appealing to the mainstream audience, so there have been a large number of texts which explain and popularize many of the principles and discoveries of cognitive science. Although often dismissed as popularizing – and hence unscholarly – in many ways these are so much more accessible, even for an academic reader. Malcolm Gladwell's *Blink* and *Outliers*, Jonah Lehrer's *How We Decide* and Zachary Shore's *Blunder* all discuss the insights of cognitive science into how and why we think the way

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[9] Gardner, *The Disciplined Mind*, 69-77.

we do. Finally, Daniel Pink's *A Whole New Mind: Moving from the Information Age to the Conceptual Age* argues that we are moving from the left-brained, logical and analytical mindset indicative of the Information Age, an era based in detail and fact, to a more right-brained, inventive and empathetic Conceptual Age based on meaning.

III. What are some possible approaches to incorporating cognitive science into pedagogy?

Again, the best person to answer this question is Howard Gardner. Among other pursuits, Gardner has been involved with Graduate School of Education at Harvard Unvversity since 1972. Much of his scholarly work and interest has been devoted to finding ways to incorporate the insights of cognitive science into pedagogy. In his 2006 book, *The Five Minds for the Future*, Gardner outlines the specific kinds of mindsets we should be educating for and toward:

1. The Disciplined Mind: is the mindset that has been schooled and trained within a disciplinary framework. This is different from having knowledge in a field; it is instead the ability to demonstrably think and understand within a particular frame of reference/point of view
2. The Synthesizing Mind: is the mindset that can make connections across disciplines in order to develop further insights and understanding not possible through only one lens. Gardner coins the phrase "multiperspectivalism" for this mindset.

3. The Creating Mind: is the mindset that allows for creation and innovation. This is more than expertise (i.e. the disciplinary mind) or the ability to connect – rather it is the ability to innovate and initiate.
4. The Respectful Mind: is the mindset that emerges from the foundational premises of respect, toleration and understanding.
5. The Ethical Mind: is the mindset that emerges from a focus on responsibility and vocation from an education that cultivates good work.

Gardner asserts that to educate for all five minds, we must begin with the Respectful mind, then develop the Disciplinary mind. Once multiple disciplines have been mastered then the Synthesizing mind can be nurtured. Finally, in late adolescence when the brain is capable of abstract, higher ordered thought, the Ethical mind can be nurtured and conceptualized. Creativity needs to be nurtured throughout the process – Gardner argues that "in the absence of relevant disciplines, it is not possible to be genuinely creative."[10] Finally he asserts that " these five minds are likely to be crucial in a world marked by the hegemony of science and technology, global transmission of huge amounts of information, handling of routine tasks by computers and robots, and ever increasing contact of all sorts between diverse populations. Those who succeed in cultivating this pentad of minds are most likely to thrive."[11] (163).

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[10] Gardner, *Five Minds for the Future* (Boston: Harvard Business School Press, 2006): 162.
[11] Gardner, *Five Minds,* 163.

Annotated Bibliography

Gardner, Howard. *The Disciplined Mind: What All Students Should Understand.* New York: Simon and Schuster, 1999.

A detailed analysis of ways cognitive insights can be applied to contemporary American education. See particularly, Chapter Two on educational constraints and Chapter Six, Designing Education for Understanding.

Gardner, Howard. *The Five Minds for the Future.* Boston: Harvard Business School Press, 2006.

Outlines the five mindsets that need to be developed in future pedagogy. Covers each in practical detail.

Gardner, Howard. *The Mind's New Science: A History of the Cognitive Revolution.* New York: Basic, 1995.

Exhaustive analysis and chronology of the development of cognitive science as well as detailed discussions of its development in various interdisciplinary branches.

Gladwell, Malcolm. *Blink: The Power of Thinking Without Thinking.* New York: Little, Brown, 2005.

Synthesizes current research to examine how we make instantaneous decision that are most often right. Clear and concise, there is a reason this was a bestseller.

Gladwell, Malcom. *Outliers: The Story of Success*. New York: Little, Brown, 2008.

Synthesizes current research to examine how we acquire mastery in knowledge. Also discusses how context and opportunity makes for success or failure. Clear and concise, there is a reason this was a bestseller.

Kandel, Eric R. *In Search of Memory: The Emergence of a New Science of Memory*. New York: Norton, 2006.

Memoir as intellectual history; excellent overview of brain science in the twentieth century.

Kashdan, Todd. *Curious?: Discovering the Missing Ingredient to a Fulfilling Life*. New York: William Morrow, 2009.

Discusses how curiosity is an essential component not only of learning but for a meaningful life.

Lakoff, George and Mark Johnson. *Philosophy in the Flesh: The Embodied Mind and Its Challenge to Western Thought*. New York: Basic, 1999.

Another exhaustive analysis of the development of cognitive science but in this instance its history and development within the field of philosophy. Discusses the various schools and theories of ontology and epistemology.

Pink, Daniel H. *A Whole New Mind: Moving from the Information Age to the Conceptual Age*. New York: Penguin, 2005.

Very useful discussion of how to expand thinking and cognition. Detailed examples, suggestions and sources in each chapter.

Rosch, Eleanor. "Reclaiming Concepts." *The Journal of Consciousness Studies* 6. 11-12 (1999): 61-77.

Rosch's work on how we classify information is very accessible and insightful.

Shore, Zachary. *Blunder: Why Smart People Make Bad Decisions*. New York: Bloomsbury, 2008.

Definition and classification of ineffective thinking. Though it uses political and historical examples, the discussion is useful for all disciplines.

Conclusions: Creating Meaning and Understanding

The significant problems we face cannot be solved at the same level of thinking we were at when we created them. -Albert Einstein

The theme that has run throughout my reading this year as well as this study is that the key to information anxiety is encouraging the capacity of understanding. The question becomes how can we best teach our students to learn to understand? That this is not a new question is, I hope, obvious by this point. However, to put our concerns in perspective, a national examination of higher education and reform in the United States during the 1880's found the following concerns:

- The curriculum is too vocational
- The curriculum is too bloated
- The quality of students is declining
- The quality of teaching is poor
- The body of knowledge to be taught in colleges is growing quickly
- The colleges are homogenous and change is difficult
- The curriculum is out of date
- There are gaps in the curriculum
- School-college relations need to be enhanced
- A safe and democratic society requires quality education
- The society is changing quickly
- Commerce and trade require strong educational programs
- Enrollments are declining
- Public confidence in public education is low
- Other agencies are competing with colleges.[1]

Again this list is from the 1880's. As Patricia Breivik and Gordon Gee observe (and do note that they wrote this comment twenty years ago in 1989), "what is significantly different today is neither the issues nor the complaints, but the arrival of the information

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[1]Qtd. in Patricia Breivik and Gordon Gee, *Information Literacy: Revolution in the Library* (New York: ACE/McMillan, 1989):1-2.

age."[2] In fact, the only real difference between 1850, 1989 and 2009 is in the amount of information, the kinds of technology that provide it, and the speed with which it can be acquired and transmitted. The real question is what we must do in order to process and understand that information.

Sociologist and professor Stanley Aronowitz argues that the worst thing we can do as educators is adopt a utilitarian model for education. He asserts that:

> Notwithstanding their anxiety about the future, students are ill-served by educational regimes that tailor their learning to a rapidly changing workplace whose technological shifts belie the assumptions driving many specialist curricula. Ironically, the best preparation for the work of the future might be to cultivate knowledge of the broadest possible kind, to make learning a way of life that in the first place is pleasurable, and then rigorously critical. For it is only when a learner loves literature, enjoys puzzling out the meaning of art works and those of philosophy, is intrigued by social and cultural theory, or becomes an indefatigable researcher that she acquires intellectual habits that are the precondition for further learning. The learner who really understands the economy knows how fragile is the concept of career.[3]

There is a lot of practical – yes even utilitarian – wisdom in Aronowitz' observations. While we cannot anticipate the kinds of changes our students will face in the future, when we look at the Information Age and the Knowledge Revolution within the broader

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[2] Breivik and Gee, 2.

[3] Stanley Aronowitz, *The Knowledge Factory: Dismantling the Corporate University and Creating True Higher Learning* (Boston: Beacon, 2000): 161.

historical perspective, then the one thing we do know is that our students must be able to process, systematize and understand the information they will invariably encounter. In that sense, their concerns will be no different than the Alexandria librarian Calimachus, the medieval monk Diderot or any of the other humans of the past faced with new information and technologies. In other words, we need to educate our students in such a way that they learn to acquire the "intellectual habits that are the precondition for further learning."

While there are certainly many solutions that have become current in today's pedagogical theory – i.e. Just-In-Teaching, Integrative Learning, Learning Communities etc – I would like to focus on the key possibilities which emerged during my study this year. What should we refocus and/or change in order to prepare our Millennial students to understand, and to thrive, in the constantly changing world they will not only inhabit, but also create in the years to come?

I. Time

Not just more time, but a different apportioning of time. Whether the ten minute quiz, the fifty-minute lecture or in-class essay, the semester/quarter calendar or the two-year/four-year divide – all of the these time distinctions have historical and sociological origins. And many of these origins are grounded in past contexts which bear little meaning in the midst of vast technological change. Certainly not enough of what cognitive science has discovered about human learning and learning potential has been applied to the individual classroom, let alone the larger system.

Benjamin Bloom was one of the first to advocate that learning requires time and so students need more time in order to succeed: "Our fundamental error, according to Bloom and (John Carroll before him) is that we treat time as a constant and permit achievement to vary. Bloom argued that we must begin to treat achievement as a constant while we design time to be variable."[4] In the 1960's, Benjamin Bloom developed the theory of "mastery learning," arguing that the main reason students fail is that they aren't allowed enough time to master skills and content:

> The process of teaching needed to be geared towards the design of tasks that would progressively and ineluctably lead to the realization of the objectives that defined the goals of the curriculum. Mastery learning is an encomium to such a conception. The variable that needed to be addressed, as Bloom saw it, was time. It made no pedagogical sense to expect all students to take the same amount of time to achieve the same objectives. There were individual differences among students, and the important thing was to accommodate those differences in order to promote learning rather than to hold time constant and to expect some students to fail.[5]

Malcom Gladwell's *Outliers* outlines how it takes ten years, or 10,000 hours, of training to acquire mastery in any given topic (as someone who has written a dissertation, I cannot argue with such a statement). This equation seems to hold steady despite our information revolution. In other words, it is not the information itself, but the mastery of it that requires time for the human mind to comprehend. He also discusses how different

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[4] Lee S. Shulman, "It's All About Time!" *Carnegie Perspectives*. The Carnegie Foundation for the Advancement of Teaching. 1.

[5] Eisner, Elliot w. *Benjamin Bloom 1913-1999.*

conceptions of time between the Asian and American/European mindset account for the gap in standardized tests in certain subjects as well as the connection between such conceptions of time and attitude.[6] He also discusses a charter school developed in a poor South Bronx inner-city neighborhood when a researcher discovered that poorer children lost significant ground when not in school, and especially over the summer. Students at the KIPP academy attend class from 7:25 am to 5pm Monday through Friday as well as Saturdays giving its students 50-60% more learning time. As a result, 84% of its students are at or above grade-average in mathematics; the average for the rest of South Bronx is 16%. In other words, "Schools *work*. The only problem with school, for the kids who aren't achieving, is that there isn't enough of it."[7]

II. Metacognition

Just as we need to reconsider our assumptions about time, what we also need to do is undergo a radical reconsideration of what we deem "Basic Skills." As should be clear by this point, the term "literacy" in the post-Knowledge Revolution world is one that encompasses far more than functional literacy. Indeed, literacy now encompasses more than functional competency or even information literacy. In fact, the term which recurred throughout my reading was Metacognition. The skillset that constitutes metacognition: synthesis, evaluation, judgment, understanding – these are all tools of critical thinking that allow us to make meaning out of random bits of data. The

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[6] See Malcolm Gladwell, *Outliers: The Story of Success* (New York: Little, Brown, 2008), Chapter Eight "Rice Paddies and Math Tests" for a detailed discussion.

[7] Gladwell, 259, italics his.

psychologist Jerome Bruner argues that "Metacognition converts ontological arguments about the nature of reality into epistemological ones about how we know....metacognition provides a reasoned base for the interpersonal negotiation of meanings, a way to achieve mutual understanding even when negotiation fails to bring consensus."[8] In other words, creating meaning and understanding will be *the* basic skill of the future.

Sociologist Stanley Aronowitz argues that literacy as a basic skill has been misunderstood, arguing that "making meaning is not a skill, but both an art and a form of critical learning." As an example he cites "Even the most mundane memorandum that goes beyond the more conveyance of information" explaining that it requires many levels from its author as it "makes a proposal for a course of action or contests a course of action proposed by another, entails complexity and narrative coherence...involves careful choice of words, a sense of dramatic presentation, an awareness of the questions that might arise from some of the author's statements, the mood of the audience, and many other considerations."[9] Indeed all of these are part not only of writing a memo but even something more mundane, the average email. However, "few framers of the undergraduate core seem to have taken these insights into account; they persist in using the term 'skill' to describe the nature of writing." So writing requires the skills of metacognition in addition to more technical skills.

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[8] Jerome Bruner, *The Culture of Education* (Cambridge: Harvard University Press, 1996): 148.

[9] Stanley Aronowitz, *The Knowledge Factory: Dismantling the Corporate University and Creating True Higher Learning* (Boston: Beacon, 2000): 140-1.

Or as the ACRL defines it:

> For example, the following outcomes illustrate "higher order" and "lower order" thinking skills:
>
> *"Lower Order" thinking skill:*
>
> Outcome 2.2.2. Identifies keywords, synonyms, and related terms for the information needed.
>
> *"Higher Order" thinking skill:*
>
> Outcome 3.3.2. Extends initial synthesis, when possible, to a higher level of abstraction to construct new hypotheses that may require additional information.[10]

III. Curiosity, Interest and Attention

Studies coming out of experiments in cognitive science are consistently proving that we learn more when we maintain a state of curiosity and inquiry, when we are interested in content/subject, and when we are paying focused attention. These are the qualities we should be not only encouraging in our students but training them to develop and master. These are what constitute the qualities of life-long learning. If our students can become curious, interested and attentive, then they would have some of the essential skills for the future. Of course part of the problem is that there are many things necessary

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[10] ACRL, "Information Literacy and Assesment," *Information Literacy Competency Standards for Higher Education* < http://www.ala.org/ala/mgrps/divs/acrl/standards/informationliteracycompetency.cfm#f1>.

to study in school which are not inherently interesting to everyone. Perhaps the key is not to change what we are teaching but how we are teaching it. We found our topics interesting enough to acquire mastery in them; how can we transmit that curiosity and interest to our students?

IV. Understanding

The pursuit of information should always have a goal in mind beyond the acquisition of knowledge. Just as the medieval memory system was specifically designed to create a whole person, so should our curriculum. One resource is Project Zero is based at the Graduate School of Education at Harvard University; founded in 1967 by Nelson Goodman, it was directed from 1972 through 2000 by David Goodman and Howard Gardner. Its emphasis is on developing better learning and education based on the kinds of research discussed in this study. Its goal is to "help create communities of reflective, independent learners; to enhance deep understanding within disciplines; and to promote critical and creative thinking."[11] APLS, or Active Learning Practice for Schools, is the electronic community created by Project Zero and the Graduate School of Education to help develop curriculum about the teaching of thinking and the role of technology in learning – in other words, to cultivate understanding. APLS defines understanding as:

> So what is understanding? In a phrase, understanding is the ability to think and act flexibly with what one knows. To put it another way, an understanding of a topic is a "flexible performance capability" with

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[11] *History of Project Zero*, < http://www.pz.harvard.edu/History/History.htm>.

> emphasis on the flexible. In keeping with this, learning for understanding is like learning a flexible performance - more like learning to improvise jazz or hold a good conversation.

In a 1995 article in the journal *Change*, community college professors Robert Barr and John Tagg outlined a New Paradigm for Undergraduate Education that advocated the shift from an Instruction Paradigm to a Learning Paradigm arguing that "Students must become active discoverers and constructors of their own knowledge."[12] Or as professor Larry Braskamp phrased it:

> A college is most effective when it is a place with a mission that is complex, multidimensional, intellectually enriching, and above all contested. Any college that takes the search for truth seriously will be a hotly contested place, since no one on this good earth has been given the truth—we all need to search for it. So ask yourself if you are engaging in activities that stretch your mind and provide meaning to you in your journey.[13]

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[12] Robert Barr and John Tagg, "From Teaching to Learning – A New Paradigm for Undergraduate Education," *Change* 27 (Nov-Dec 1995): 13.

[13] Larry Braskamp, "Three Central Questions Worth Asking," *Journal of College and Character* 9.1 (2007): 4.

Bibliography

ACRL. "Information Literacy Competency Standards for Higher Education." <http://www.ala.org/ala/mgrps/divs/acrl/standards/informationliteracycompetency .cfm >.

American Library Association Presidential Committee on Information Literacy, *Final Report*. <http://www.ala.org/ala/mgrps/divs/acrl/publications/whitepapers/ presidential.cfm >

Aronowitz, Stanley. *The Knowledge Factory: Dismantling the Corporate University and Creating True Higher Learning*. Boston: Beacon, 2000.

Banjo, Shelly. "A Perfect Match?" *Wall Street Journal* 13 Oct 2008: R9.

Barr, Robert B. and John Tagg. "From Teaching to Learning – A New Paradigm for Undergraduate Education." *Change* 27 (November/December 1995): 12-25.

Brand, Stewart. *The Clock of the Long Now: Time and Responsibility*. New York: Basic Books, 1999.

Braskamp, Larry. "Three 'Central' Questions Worth Asking." *Journal of College and Character*. 9.1 (2007): 1-7.

Breivik, Patricia Senn, and E. Gordon Gee. *Information Literacy: Revolution in the Library*. New York: ACE/McMillan, 1989.

Bruce, Christine. *Seven Faces of Literacy*. Auslib Press, 1997. <http://www.ala.org/ala/mgrps/divs/acrl/issues/infolit/bibliographies/readingsfaculty.cfm>. (accessed Oct 2007).

Bruner, Jerome. *The Culture of Education*. Cambridge: Harvard University Press, 1996.

Carruthers, Mary. *The Book of Memory: A Study of Memory in Medieval Culture*. Cambridge: Cambridge University Press, 1990.

Carruthers, Mary. *The Craft of Tradition: Meditation, Rhetoric and the Making of Images 400-1200*. Cambridge: Cambridge University Press, 1998.

Chickering, Arthur W. and Stephen Ehrmann. "Implementing the Seven Principles: Technology as a Lever." *AAHE Bulletin* October 1996: 3-6. <http://www.tltgroup.org/programs/seven.html>.

Chow, Rey. "An Addiction From Which We May Never Get Free." *New Literary History* 36 (2005): 47–55.

Cotrell, Janet R. and Michael Eisenberg. "Applying an Information Problem-solving Model to Academic Reference Work: Findings and Implications." *College and Research Libraries* July 2001: 334-47.

Crane, Mary T. *Shakespeare's Brain: Reading with Cognitive Theory*. Princeton: Princeton University Press, 2001.

Csikszentmihalyi, Mihaly. *Flow: The Psychology of Optimal Experience*. New York: Harper, 1990.

Davenport, Thomas H. *Thinking for a Living: How to Get Better Performance and Results from Knowledge Workers*. Cambridge: Harvard University Press, 2005.

Drucker, Peter. *The Essential Drucker*. New York: Harper Business, 2001.

Dweck, Carol S. *Mindset: The New Psychology of Success*. New York: Random House, 2006.

Eisenberg, Micheal B., Carrie A. Lowe, and Kathleen L. Spitzer. *Information Literacy: Essential Skills for the Information Age*. 2nd ed. Westport, CT: Libraries Unlimited, 2004.

Flanagan, Owen J. *The Science of the Mind*. 2nd ed. Cambridge: MIT Press, 1991.

Foster, Andrea. "Information Navigation 101." *Chronicle of Higher Education* 9 March 2007:A 38.

Gallagher, Winifred. *Rapt: Attention and the Focused Life*. New York: Penguin, 2009.

Gardner, Howard. *The Disciplined Mind: What All Students Should Understand*. New York: Simon and Schuster, 1999.

Gardner, Howard. *The Five Minds for the Future*. Boston: Harvard Business School Press, 2006.

Gardner, Howard. *The Mind's New Science: A History of the Cognitive Revolution*. New York: Basic, 1995.

Gladwell, Malcolm. *Blink: The Power of Thinking Without Thinking*. New York: Little, Brown, 2005.

Gladwell, Malcolm. *The Tipping Point: How Little Things Can Make a Big Difference*. New York: Little, Brown, 2002.

Gladwell, Malcom. *Outliers: The Story of Success*. New York: Little, Brown, 2008.

Harpham, Geoffrey Galt. "Beneath and Beyond the 'Crisis in the Humanities'." *New Literary History* 36 (2005): 21–36.

Head, Alison J. "Beyond Google: How Do Students Conduct Academic Research?" *First Monday* 12.8 (August 2007). <firstmonday.org/issues/issue12_8/head/index.html>.

Hogan, Patrick C. *Cognitive Science, Literature and the Arts*. New York: Routledge, 2003.

Howe, Neil and William Strauss. *Millennials Rising: The Next Great Generation*. New York: Vintage, 2000.

Kandel, Eric R. *In Search of Memory: The Emergence of a New Science of Memory*. New York: Norton, 2006.

Kashdan, Todd. *Curious?: Discovering the Missing Ingredient to a Fulfilling Life*. New York: William Morrow, 2009.

Kuhn, Thomas. *The Structure of Scientific Revolutions*. Chicago: University of Chicago Press, 1996.

Kurthau, Carol C. "Inside the Search Process: Information From the User's Perspective." *Journal of the American Society For Information Science* 42.5 (1991): 361-371.

Lakoff, George and Mark Johnson. *Philosophy in the Flesh: The Embodied Mind and Its Challenge to Western Thought*. New York: Basic, 1999.

Lehrer, Jonah. *How We Decide*. Boston: HoughtonMifflin, 2009.

Lowe, Carrie. "Research Foundations of the Big6 Skills." <www.big6.com/showarticle.php?id=145>.

Manguel, Alberto. *The Library at Night*. New Haven, CT: Yale UP, 2008.

McGirt, Ellen. "Getting Out From Under." *Fortune* 20 March 2006. <http://www.money.com/cnn.com/magazines/fortune/fortune_archives/2006/03/0/8371814/index.htm>.

Miller, William and Rita M. Pellen, eds. *Libraries and Google*. Binghamton, NY: Haworth Information Press, 2005.

Naisbett, John and Patricia Aburdene. *Megatrends 2000: Ten New Directions for the 1990's*. New York: William Morrow, 1990.

NCTE. *21st Century Literacies: A Policy Research Brief*. 2007.

Ong, Walter J. *Orality and Literacy: The Technologizing of the Word*. New York: Routledge, 1988.

Perkins, David. *Archimedes' Bathtub: The Art and Logic of Breakthrough Thinking*. New York: Norton, 2000.

Pink, Daniel H. *A Whole New Mind: Moving from the Information Age to the Conceptual Age*. New York: Penguin, 2005.

Pinker, Steven. *How the Mind Works*. New York: Norton, 1997.

Prensky, Mark. "Backup Education?" *Educational Technology* 48.1 (Jan-Feb 2008). <http://www.marcprensky.com/writing/default.asp>.

Prensky, Mark. "Digital Natives, Digital Immigrants." *On the Horizon* 9.5 (October 2001). <http://www.marcprensky.com/writing/default.asp>.

Prensky, Mark. "Digital Natives, Digital Immigrants Part II – Do They Really Think Differently?" *On the Horizon* 9.6 (October2001). <http://www.marcprensky.com/writing/default.asp>.

Reingold, Howard. *Tools for Thought: The History and Future of Mind-Expanding Technology*. New York: Simon and Schuster,1985. <http://www.rheingold.com/texts/tft/>.

Rosch, Eleanor. "Reclaiming Concepts." *The Journal of Consciousness Studies* 6. 11-12 (1999): 61-77.

Roszak, Theodore. *The Cult of Information: The Folklore of Computers and the True Art of Thinking*. New York: Pantheon, 1986.

Senge, Peter M. *The Fifth Discipline: The Art and Practice of The Learning Organization*. New York: Doubleday Currency,1990.

Schacter, Daniel L. *Searching for Memory: The Brain, the Mind and the Past*. New York: Basic, 1996.

Shapiro, Jeremy J. and Shelley K. Hughes. "Information Literacy as a Liberal Art." *Educom Review* 31.2 (March/April 1996).

Shore, Zachary. *Blunder: Why Smart People Make Bad Decisions*. New York: Bloomsbury, 2008.

Shulman, Lee S. "It's All About Time!" *Carnegie Perspectives*. The Carnegie Foundation for the Advancement of Teaching. http://carnegiefoundation.org/perspectives.

Stock, Brian. *Listening to the Text: On the Uses of the Past*. Philadelphia: University of Pennsylvannia Press,1996.

Tharp, Twyla. *The Creative Habit: Learn It and Use It For Life*. New York: Simon and Schuster, 2003.

Toffler, Alvin. *Future Shock*. New York: Bantam, 1990.

Toffler, Alvin. *The Third Wave*. New York: Morrow, 1980.

Tufte, Edward R. *Beautiful Evidence*. Chesire, CT: Graphics Press LLC, 2000.

Turner, Mark. *The Literary Mind: The Origins of Thought and Language*. New York: Oxford University Press, 1996.

Turner, Mark. *Reading Minds: The Study of Minds in the Age of Cognitive Science*. Princeton: Princeton University Press, 1991.

Wallace, Mike. *The Way We Will Be Fifty Years From Today: 60 of the World's Greatest Minds Share Their Visions of the Next Half Century*. Nashville: Thomas Nelson, 2008.

Wurman, Richard Saul. *Information Anxiety: What to Do When Information Doesn't Tell You What You Need to Know*. New York, Bantam, 1990.

Wright, Alex. *Glut: Mastering Information Through the Ages*. Washington, D.C.: Joseph Henry Press, 2007.

Yates, Frances A. *The Art of Memory.* Chicago: University of Chicago Press, 1966.

Zogby, John. *The Way We'll Be: The Zogby Report on the Transformation of the American Dream*. New York: Random House, 2008.

Survey of Upper-Division Research Methodologies

I. Overview

A secondary consideration for my project was to discover the current role of research instruction and information literacy at the upper division level: how do four-year colleges and universities teach the research process in their curriculums? Are they aware of information literacy and the consequences of the information revolution, or the insights of cognitive science?

One of the fundamental cornerstones of any English department is the teaching of freshman composition; in fact the freshman composition course was the historical building block in the development of English departments themselves. Traditionally the pedagogy for this course has focused on the teaching of essay, or expository, writing. However, the teaching of the research process and the writing of at least one research essay/paper also plays a role in the traditional freshman composition class. However, over the past twenty years or so, multiple factors have made the teaching of writing at the college level more complex. One such factor is the difference between expository and argumentative writing. Expository, or analytical, writing has been the traditional mode for freshman composition. Another factor has been the demand for more critical thinking instruction, so the necessity to teach argumentative and persuasive writing has also increased. Concurrently, the basic skills and skill set of the average college student have weakened. As a result, college English departments are now called to do more than ever before.

This demand is reflected in the traditional two-semester (or two-quarter) sequence of writing courses at most four-year schools. The first semester is traditionally an exploration of analysis and exposition that focuses on developing basic academic writing skills and familiarity with the writing process. The second course focuses on conceptualizing inquiry and argumentation, or alternatively literature, along with the research process and the writing of at least one research paper. As you will see, this remains the norm at most four-year institutions.

Within the discipline of English, and its offshoot, Composition and Rhetoric, there are many theoretical approaches to the teaching of writing. Some of the most pervasive approaches over the past fifteen years have included writing across the curriculum, portfolio-based writing and discipline-specific writing. While these are all still current along with other discourses and controversies within the field, theoretical innovation in regards to research pedagogy has been almost non-existent. The teaching of the research process and the writing of the research paper, again traditionally within the jurisdiction of the English department, has followed a fairly standard format for the past forty or so years. Most freshman level rhetoric texts and handbooks outline a concrete and seemingly linear research process, grounded in traditional library research that focuses on scholarly books and journals. This process moves from the acquisition of information (usually in its most traditional scholarly forms), to the analysis and synthesis of the information, to the writing of a research paper and finally, the documentation format. Interestingly, this process follows a fundamental intellectual and cognitive pattern – the very same pattern that more current information literacy guidelines are built upon. However, information literacy guidelines and research pedagogy take a much more

complex and often far more nuanced approach to the process. However, most freshman composition courses and textbooks seem to remain unaware of any developments within the fields of information literacy and information acquisition, let alone the insights of cognitive science. What innovation there is seems to be motivated more by the increasing professionalization of the field of Composition and Rhetoric as well as university-wide calls for accountability via varying forms of SLO/GEO and basic skill objectives. At these institutions, there seems to be a trend to creating a new variant of freshman composition: a one semester, four unit course which focuses on argumentation and research with additional required writing courses as discipline specific courses.

II. My Methodology

Because this part of the project came after my reading on information literacy, I realized what I really needed to discover was not what traditional methods were being used in other department, but rather whether any other English departments were incorporating these new components of pedagogy and knowledge work. So I focused my questions on that: whether information literacy was part of the individual English department itself and/or whether it was handled by the school's library. I also wanted to know the basic sequence of freshman composition courses and whether there were any research requirements within that sequence, and if so, where in the sequence research was required. So I decided to ask if the member(s) of the English department knew whether information literacy was part of their own department's curriculum and/or whether it was part of the their library's institutional offerings. I asked what the required composition courses were (and what department offered them). I also wanted to know whether there

was a required research component (i.e. was research part of the course objectives) and whether there was an institution/department mandate for a specific/required research assignment. These are the basic questions I considered:

1. What is your school?

   What is your Location?
2. Do you know if Information Literacy is part of your departmental curriculum?
   a. If yes, what forms of instruction:
3. Do you know if Information Literacy is part of your library's curriculum?
   a. If yes, what forms of instruction:
4. What are your basic/required composition courses(s) – along with any required writing courses for the English major?
5. Do you have a required research component in any of those courses?
6. Do you have an institutional or department required research project in any of those courses?

And while not a large sample, it is a deliberately random one in which I tried to find as many different schools as I could: public, private, large, small, urban, rural etc. I also deliberately tried to avoid our most popular local transfer schools (i.e. Cal Poly Pomona, Cal State Fullerton, UCLA etc.) as I wanted to consider the state of research pedagogy in four-year institutions in general – rather than bringing any assumptions of what I thought I knew to the results.

There is a much more consistent pattern than I was expecting from these survey results. Certain trends became very clear, very quickly as I acquired my survey information. So these are the trends to look for as you review the survey results:

- Whether the department maintains the traditional 2-semester/quarter or has switched to the one semester
- Whether such courses are taught by a department other than English
- Whether any English department seems to be aware of information literacy
- How consistent university libraries are in their information literacy offerings
- How consistent English departments are in the linkage of argumentation and research

III. Survey Information

California State University, Los Angeles

1. Location: Los Angeles, CA
2. Information Literacy in Department Curriculum: Yes
    a. If yes, what forms of instruction: Eng 102 requires information literacy
3. Information Literacy in Library Curriculum: Yes
    a. If yes, what forms of instruction: Online Tutorials and Online Discipline-Specific Information Guides
4. Composition Courses(s): a required 2-quarter, 4-unit course sequence: Eng 101-102

5. Required Research Component: Yes, Eng 102 focuses on argument and research (termed information literacy)

California State University, San Bernardino

1. Location: San Bernardino, CA
2. Information Literacy in Department Curriculum: No
3. Information Literacy in Library Curriculum: Yes
    a. If yes, what forms of instruction: Online Tutorials and Online Discipline-Specific Information Guides
4. Composition Courses(s): A 2 semester sequence: a required 1 semester, 4-unit course, Eng 101, Freshman Composition. In addition, another 1 semester, 4-unit course writing course is required as an upperclassman with six options depending on discipline (i.e. Eng 306, Hum 306, MGMT 306 etc).
5. Required Research Component: Yes, the 306 courses focus on critical thinking and research

California State University, San Marcos

1. Location: San Marcos, CA
2. Information Literacy in Department Curriculum: No
3. Information Literacy in Library Curriculum: Yes
    a. If yes, what forms of instruction: Online Subject Guides
4. Composition Courses(s): a required 1 semester, 3-unit course GEW 101, Principles of Written Communication which is taught through the First Year

Program rather than the Literature and Writing Dept; also LTWR 100 Introduction to Literature and LTWR 115 Critical Reading, Thinking and Writing for English majors

5. Required Research Component: No

College of Charleston

1. Location: Charleston, SC
2. Information Literacy in Department Curriculum: No
3. Information Literacy in Library Curriculum: Yes
    a. If yes, what forms of instruction: Online Tutorials and Online Discipline-Specific Information Guides
4. Composition Courses(s): C of C recently switched from the more traditional 2-semester English composition sequence to a new required 1 semester, 4 unit class English 110, Introduction to Academic Writing
5. Required Research Component: Yes, English 110 focuses on argumentation and research

Eastern Michigan University

1. Location: Ypsilanti, MI
2. Information Literacy in Department Curriculum: No
3. Information Literacy in Library Curriculum: Yes

   a. If yes, what forms of instruction: Online Tutorials and Online Discipline-Specific Information Guides

4. Composition Courses(s): a required 2 semester, 3-unit course sequence, English 120-121 (although 120 can be waved by appropriate SAT, ACT or AP score); also Engl 323, Writing in the Professional World; Engl 324, Principles of Technical Communication; Engl 326, Research Writing; Engl 328, Writing, Style and Technology; Engl 417, Writing About Controversies
5. Required Research Component: Yes, English 121 focuses on argumentation and research
6. Required Research Project: Yes, Eng 121 requires at least two research papers

George Washington University

1. Location: Washington, D.C.
2. Information Literacy in Department Curriculum: No
3. Information Literacy in Library Curriculum: Yes
   a. If yes, what forms of instruction: Online Tutorials, Online Discipline-Specific Information Guides and RefWorks workshops
4. Composition Courses(s): A 3 semester sequence: a required 1 semester, 4 unit theme-based class UW 20, University Writing, administered by the University Writing Program rather than the Language and Literature Dept followed by 2 semesters of writing intensive 3-unit electives in the disciplines

5. Required Research Component: Yes, UW 20 focuses on argumentation and research

Jacksonville State University

1. Location: Jacksonville, AL
2. Information Literacy in Department Curriculum: No
3. Information Literacy in Library Curriculum: Yes
    a. If yes, what forms of instruction: Online Tutorials, Online Discipline-Specific Information Guides and Handouts/Downloads
4. Composition Courses(s): a required 2 semester, 3-unit course sequence: English 101-2; also Eng 322, Technical Writing; Eng 344, Advanced Composition; and Eng 415, Advanced Expository Writing
5. Required Research Component: Yes, Eng 102 focuses on literature and research
6. Required Research Project: Yes, Eng 102 requires a research paper

New York University

1. Location: New York City, NY
2. Information Literacy in Department Curriculum: No
3. Information Literacy in Library Curriculum: Yes
    a. If yes, what forms of instruction: Library Instruction Courses, Online Tutorials and Online Discipline-Specific Information Guides

4. Composition Courses(s): V40, Writing the Essay, is a required 1 semester, 4 unit course administered through the Expository Writing Program rather than the College of Arts and Science's English Department.
5. Required Research Component: Yes, V40 focuses on argumentation and research

Presbyterian College

1. Location: Clinton, SC
2. Information Literacy in Department Curriculum: No
3. Information Literacy in Library Curriculum: Yes
    a. If yes, what forms of instruction: Online Tutorials
4. Composition Courses(s): a required 2 semester, 3-unit course sequence, English 110-111, Composition and World Literature, which highlights PC's emphasis on intercultural learning and experiences
5. Required Research Component: Yes, Eng 111 focuses on literature and research

Sam Houston State University

1. Location: Huntsville, TX
2. Information Literacy in Department Curriculum: No
3. Information Literacy in Library Curriculum: Yes
    a. If yes, what forms of instruction: Online Tutorials and Online Discipline-Specific Information Guides

4. Composition Courses(s): a required 2 semester, 3-unit course sequence: English 164-165; also Eng 330 Technical Writing; Eng 337 Argumentation and Persuasion; and Eng 380 Advanced Composition
5. Required Research Component: Yes, English 165 focuses on argumentation and research
6. Required Research Project: Yes, Eng 165 requires at least one research paper

Southeastern Illinois University at Edwardsville

1. Location: Edwardsville, IL
2. Information Literacy in Department Curriculum: No
3. Information Literacy in Library Curriculum: Yes
    a. If yes, what forms of instruction: Library Instruction Courses, Online Tutorials and Online Discipline-Specific Information Guides
4. Composition Courses(s): a required 2 semester, 3-unit course sequence: English 101-102; also English 201, Intermediate Composition for majors
5. Required Research Component: Yes, English 102 focuses on argumentation and research
6. Required Research Project: Yes, English 102 requires at least one research paper

San Jose State University

1. Location: San Jose, California
2. Information Literacy in Department Curriculum: No

3. Information Literacy in Library in Library Curriculum: Yes
    a. If yes, what forms of instruction: Online Tutorials and Online Discipline-Specific Information Guides
4. Composition Courses(s): a required 2 semester, 3-unit course sequence, Eng 1A-1B; also English 100W, the Writing Workshop for Majors
5. Required Research Component: Yes, English 1B focuses on argumentation and research
6. Required Research Project: Yes, English 1B requires at least one research paper

University of North Carolina, Asheville

1. Location: Asheville, NC
2. Information Literacy in Department Curriculum: Yes
    a. If yes, what forms of instruction: Lang 120 is considered an Information Literacy Intensive course and fulfills one of the two Information Literacy Intensive courses now required for graduation
3. Information Literacy in Library Curriculum: Yes
    a. If yes, what forms of instruction: Online Tutorials and Online Discipline-Specific Information Guides
4. Composition Courses(s): UNCA recently switched from the more traditional 2 semester English composition sequence to a new required 1 semester, 4-unit class Lang 120, Foundation of Academic Writing; new writing intensive seminars are also being offered in the individual disciplines

5. Required Research Component: Yes, Lang 120 focuses on argumentation and research

Virginia Military Institute

1. Location: Lexington, VA
2. Information Literacy in Department Curriculum: No
3. Information Literacy in Library Curriculum: Some
    a. If yes, what forms of instruction: Online tutorials being developed
4. Composition Courses(s): a required 2 semester, 3-unit course sequence: Eng 101-2; also Eng 468 Seminar in Rhetoric and Writing
5. Required Research Component: Yes, Eng 102 focuses on argumentation and research

IV. Conclusions

A. Course/ Curriculum Review:

The most fundamental conclusion to draw is that the Mt. SAC English, Literature and Journalism Department's (ELJD) current required composition course, English 1A, Freshman Composition, seems to be an amalgamation of the standard 2 semester course paradigm. The course description for 1A reads:

> Develops effective expository writing skills; investigates the principles and methods of composition as applied to the writing of essays and the research paper; emphasizes critical reading of academic material.

The advanced composition course, English 1C, Critical Thinking, addresses the argumentation and critical thinking components found in most second semester composition courses, but without the research component. The course description for 1C reads:

> Develops critical thinking, reading, and writing skills beyond the level achieved in ENGL 1A. Increases the student's capacity for logical analysis and argumentative writing.

As the second of our College Goals/Strategic Objectives this year (2008-9) is that "The College will prepare students for success through the development and support of exemplary programs and services," we need to review and reconsider our basic writing course offerings. Both our pedagogical ideals and our commitment to provide the best education for our students would seem to require us to make sure that our courses are indeed exemplary.

B. Citation/Documentation

I did not specifically ask which documentation/citation system individual English departments used as I assumed (correctly) that it was the MLA citation system. But an interesting discussion developed over the course of Summer 2009 via one of my academic listservs over whether the MLA system makes pedagogic sense. In large part this is due to factors which may only be implicit in this report, but are most cogent here. One is the continuing force of rapidity and speed by which the nature of information itself and the way we access it is changing. Most academic documentation systems simply cannot keep up. In fact one of my most recent (at least in academic time) articles caused a great deal of concern for my editors as I cited so many websites; the concern wasn't my use of the internet, but rather how to cite my use of it properly. This is a problem all of our students will continue to face as well in the years to come. Another point is that most college and university libraries and writing centers already provide both onsite and online resources for this very same citation/documentation information. And because information literacy is their discipline, they tend to be more up-to-date and accurate than the average English professor. Perhaps there are more effective ways for us to work together to the benefit of all our students. In addition, most published academic scholarship in the humanities follows the Chicago rather than the MLA system; in, fact, all my academic work has required me to use this system. In other words, although I teach the MLA system, I have never used it in a professional capacity. Since this information is available from multiple on-campus sources as well as computer software programs, shouldn't we be reconsidering ways in which to use all these resources to their best advantage and in the best interests of our students?

C. Articulation Across College Boundaries

Another College Goal/Strategic Objective this year, Number Eleven, is "The College will improve effectiveness and consistency of dialogue between and among departments, committees, teams, and employee groups across the campus." I would like to see such a consistent dialogue develop between the ELJD, the Mt SAC Library, and the Writing Center as there are so many reasons why we should be working together. Many of the changes we need to consider in the curriculum dovetail with what these two other programs are already doing. And since information literacy as well as writing skills fall under the rubric of basic skills, perhaps there are ways professional development, program review etc can all be brought to bear to accomplish such articulation successfully.

D. Thinking and Planning Forward

It was clear to me as I surveyed my colleagues that most English professors and English departments are unaware of the changes, trends and new methodologies that I have articulated in the first half of this report. This is probably true of most disciplines and departments across college campuses throughout the U.S., so I am in no way singling out English departments versus other departments. But as English professors we not only teach one of the most vital basic skills, but also what is in so many ways, the gateway course for every college student. Accordingly, we have a special responsibility both to our students and to our discipline to continue to learn, to grow and to evolve as the nature of the world around us changes.

I think there are four ways to do this successfully. First as individual thinkers and educators, we have to continue to be able to develop new knowledge and ideas. How can we teach others to do what we are not willing to do ourselves? I think that professional activity and development is vital to this process. Second, as a department, we have to continue to welcome and develop new ideas. And as well to continually rethink and reconsider what it is we think we know. Third, is the gathering of all our resources here at Mt SAC to help us; there is no need to reinvent the wheel if someone already has a good solution.

The fourth way is easily the most difficult: to always think different, to think forward, and to think beyond what we already see and know. In order to do that we must constantly challenge our own assumptions, actively pursue new ideas and reshape the boundaries of our own minds. The following are the two course descriptions I found the most intriguing as surveyed other departments: not necessarily for direct application to

our own courses and college but for what they suggest about the possibility and promise of new ideas:

Eastern Michigan University

ENGL 121 – Composition II: Researching and Writing the Public Experience (3 hrs)

English 121 focuses on writing, reading, and research as processes for inquiry. The emphasis in the course is on using multiple modes of research to develop writing, reading, thinking, and research strategies used in academic and other public contexts. Students in this course complete between 50 – 80 pages of writing per semester that culminate in three 5 – 8 page essays, at least two of which are researched essays. At the end of the course, students participate in the Celebration of Student Writing, a large event featuring projects based on the work of students in English 121. English 121 is required of most EMU students and is a prerequisite for most courses across the university.

Cal State University San Marcos

GEL 200 (3)

The Student in an Information Society

Teaches the student how to become information-literate by exploring individual well-being in this information age. Using the library as a learning laboratory, the student will explore the various aspects of the Information Age as it is changing American and global societies. Familiarizes students with the technologies and systems that are shaping this age. By researching selected topics dealing with social, psychological and physiological well-being, students will come to understand how information is generated, acquired, preserved and transmitted; learning how to write a successful research paper while developing the skills required of lifelong learners.

Ultimately, the principle of life-long learning is mere rhetoric if we apply it only to our students. One of our goals as educators and as individuals has to be the willingness to think forward and to change as we too face an everchanging future.