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Information Fluency and Education Reform: Assessment Tools and Across-the-Curriculum Initiatives

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Introduction

College graduates unable to communicate fluently would obviously face more stumbling blocks along their lifelong learning pathways than graduates who are proficient at communicating fluently. The same holds true for any college graduate who may not be "information fluent." A graduate with basic computer software and hardware skills; understands how websites work; can find and evaluate information; understands privacy, security and ethical issues related to online information; and is able to present valid information effectively – in other words, a graduate who could be considered information fluent – would certainly be a step ahead of a graduate who was weak in such skills.

This is especially true within the context of our fluid and frequently changing digital/information society where new technologies and vehicles for disseminating information-podcasting, online social networking and bookmarking, the blogosphere, wikis, etc.-grow in usage and popularity seemingly overnight.

> The benefits of the Internet age carry with them a number of serious issues concerning quality of information, access, and commercialization of information, development and preservation of knowledge and student learning.
>
> We in higher education need to provide a meaningful framework for the various components of the expanding information base; we need to ensure open access to information; and we need to teach people how to choose wisely among the variety of information resources.[1]

Elements for building a meaningful framework around information fluency initiatives are presented in this paper. Information fluency here is used as a term that can include all or partial elements of the definitions educators typically apply to information literacy, computer literacy, and information and communication technology (ICT) skills.

At the start of this paper, a point is made that information fluency initiatives are starting to become part of a higher education reform movement. This is followed by a description of some noteworthy information-fluency-related assessment tools and practices being utilized in higher education today. Also included are descriptions of three institutions that have significant information-fluency-related initiatives in place that emphasize across-the-curriculum practice.

Information Fluency as Education Reform

Has higher education reached a new plateau where information fluency initiatives are representative of an early-phase education reform movement?

> We are gaining a much clearer picture of the activities associated with student learning through the National Survey of Student Engagement (NSSE); at the same time, we are realizing the richness of the expanding array of abilities known as information literacy and related concepts such as information fluency and ICT skills.[2]

Within the education reform question, information fluency is construed as

- a "way of thinking" in which "faculty, librarians, and others create new understandings, new knowledge, and personal growth;"
- a "dispositional habit" that, when sustained, reaches "across disciplinary boundaries... to form a habit of mind that seeks ongoing improvement and self-discipline in inquiry, research, and integration of knowledge from varied sources;" and
- "a collective enterprise in the academy through a set of cultural practices. . .," whereby "apprentice-like environments takes students to a new plane of thinking, acting, and being information-literate professionals." [3]

> Information literacy becomes central to the learning culture when individual students, faculty, and librarians see how individual ways of thinking, collective dispositional habits, and cultural practices begin to merge beyond the individual, course, departmental, or program levels into a pervasive feature of the academic community. [4]

Assessment

There are many strategies and instruments used by colleges and universities across the coun-

try to discover and evaluate students' information-fluency-related habits and skills. A review of the literature that was part of an information literacy project at the University of Maryland, Baltimore County (UMBC) found more than 70 information literacy survey instruments at colleges and universities across the country. Many of these instruments contain elements of, but are not solely based on, the American Association of School Libraries (ACRL) Information Literacy Competency Standards for Higher Education. [5]

Four well-cultivated assessments available to institutions (three are fee-based of varied costs and one is free) aligned with measuring the information-fluency-related habits and skills of students are:

- The Educational Testing Service Information and Communications Technologies Literacy Assessment
- Project SAILS (Standardized Assessment of Information Literacy Skills)
- The Bay Area Community Colleges Information Competency Assessment Project
- James Madison University Information Competency Exams

The Educational Testing Service (ETS) Information and Communications Technologies (ICT) Literacy Assessment

From September 2003 through June 2004 ETS spent more than 1,000 hours developing the first iteration of the ICT Literacy Assessment that has resulted in a Web-based, interactive tool designed to measure cognitive problem-solving and critical-thinking skills associated with using technology to handle information. The ICT test covers both computer literacy skills and information literacy skills. It measures ICT literacy within the context of seven proficiencies:

- Define: Ability to formulate a research statement and use ICT tools to identify and represent an information need.
- Access: Ability to find and retrieve information from a variety of sources, including digital environments.
- Evaluate: Ability to judge the appropriateness and adequacy of information including having an understanding of how to evaluate quality, relevance, authority, point of view/bias, currency, coverage, and accuracy of digital information.
- Manage: Ability to organize information for later retrieval, including an ability to apply existing organizational or classification scheme for digital information.
- Integrate: Ability to interpret, represent, summarize, compare/contrast, and/or synthesize information from a variety of sources.
- Create: Ability to generate, adapt, express, support, apply, and/or design information in digital environments.
- Communicate: Ability to disseminate information relevant to an audience in a digital format, including being able to gear electronic information to an audience and communicate knowledge in the appropriate venue. [6, 7, 8]

The ICT Literacy Assessment has an "Evidence Centered Design" (ECD) that includes interactive tasks using simulated software in real-life scenarios. For example,

> in the assessment, a student might encounter a scenario that requires her to access information from a database using a search engine. The results are tracked and strategies scored based on how she searches for information, such as key words, sequentially refined search strategies, etc. Her proficiency is estimated based on her ability to identify how well the information returned meets the needs of the task. [9]

In January 2005 ETS delivered an institution-level ICT Literacy Assessment to about 5,000 students at 30 institutions. Most of the students were enrolled in California State University institutions. At this time it was a 2-hour test (it has since been reduced to 75 minutes), and the score reports were issued only at the institutional level. Some of the results that came out of this large testing included:

- 48 percent identified a Web site that met criteria for timeliness, authority, and objectivity.
- When constructing a persuasive presentation slide, 80 percent included irrelevant points.
- Few students accurately map material for a new audience.

- Community college students did not perform as well as students from 4-year institutions. [10]

The results of this large-scale test, as well as a number of additional field trials and pilots held during 2004 through 2006, helped ETS to revise the ICT Literacy Assessment into a new 75-minute test, offered at two levels of difficulty-one at a core level and one at an advanced level-measuring the aforementioned seven proficiencies.

> The advanced test is geared towards basically answering the question, 'Are students ready for the ICT literacy demands of upper-level course work?' Whereas the core test is more, 'Are students ready for the ICT literacy demands of college?' [11]

ETS has also incorporated a model for individuals to receive score reports, as opposed to the institutional scores that were utilized in the earlier field tests, pilots and large-scale administration of the ICT Literacy Assessment. Individual core and advanced tests are now scored through a "calibration group" process. The calibration group for the advanced test is comprised of sophomores, juniors and seniors. For the core test, it's high school seniors and college freshmen. Scores are scaled so they have a certain mean and standard deviation based on these two calibrations groups.[12]

Additionally, ETS moved to a continuous testing model in August 2006, meaning that institutions can administer the ICT Literacy Assessment whenever they want. Administering the ICT Literacy Assessment was priced in September 2006 from $27 per test to $33 per test, depending on the number of tests ordered.[13]

Project SAILS

Project SAILS, which started its early development phase in 2001, is a fee-based, multiple-choice test. As much as feasibly possible, it is based on information literacy skills listed inside the ACRL Information Literacy Competency Standards for Higher Education. It does not cover computer literacy skills. The 2006-07 pricing was $3.00 per student up to a cap of $2,000 per administration. The project is based at Kent State University and has been supported by the Institute of Museum and Library Sciences, the Association of Research Libraries, the Ohio Board of Regents, and the Academic Library Association of Ohio. Eighty-two higher education institutions in Canada and the U.S. participated in the research and development phase of Project SAILS.[14]

The test contains 45 questions and takes approximately 35 minutes to complete. It is administered during the Fall (August through December 15) and Spring (January through May 15). Only cohort scores are provided, not individual scores.

> At the end of a test session, schools receive reports detailing the performance of their students on the SAILS test. Results are organized by ACRL standards and by skill sets.
>
> Student performance is also compared to performance at groups of other schools.[15]

According to the project administrator of Project SAILS, it is an easy test to administer on a large scale for discovering what students know about information literacy. After a three-year research and development phase that included a third-phase field testing of 19,000 students from 60 institutions, Project SAILS was retooled and officially made commercially available in August 2006. [16]

The analyses of the third-phase field testing revealed, in part, that

- there was a noticeable difference between associates-degree-granting institutions and all other institutions;
- in most skill sets, the differences are not significant;
- history majors performed significantly better than most majors; and
- business majors performed significantly better than all other majors on skill set 8 of the ACRL Information Literacy Competency Standards for Higher Education, which is related to evaluating and revising search results.[17]

The project administrator added that all of the test questions have been grouped inside what the Project SAILS team considers to be meaningful information literacy skill sets. It was also noted that the test is developed and operated under a

continuous improvement cycle whereby more questions could be added to the test bank as more data is collected from test results. [18]

The Bay Area Community Colleges Information Competency Assessment Project

The Bay Area Community Colleges Information Competency Assessment Project began in 2000, before the ETS ICT Literacy Assessment and Project SAILS came onto the scene of information literacy assessment. The project evolved from a Diablo Valley College initiative along with statewide initiatives that were geared toward developing an information competency graduation requirement at the associate degree level for all California community colleges. The exam created from this project contains multiple-choice, matching and short-answer questions, as well as performance-based exercises. Like Project SAILS, it does not cover computer literacy, and it is, as much as feasibly possible, based on the ACRL Information Literacy Competency Standards for Higher Education. Unlike Project SAILS and the ETS ICT Literacy Assessment, the Bay Area Community Colleges Information Competency instrument is currently available for free. However, the exam was never fully developed. As noted on its website, educators are welcome to make a request to receive copies of the two-part assessment instrument at no cost, but "the exam was not sufficiently field-tested for the project team to confirm its absolute validity and reliability." [19, 20, 21]

The project leader of the Bay Area Community Colleges Information Competency Assessment Project explains that although the initiative did actually conduct two field tests during its development, it never made it to a final step for complete confidence about is validity and reliability. However, some community colleges in California are, in fact, using the exam in one form or another today.

> All of us (Bay Area Community Colleges) had very individual, institutional purposes for working on the Information Competency Assessment Project. For our purposes we had gone as far as we needed. Many of the Bay Area Community Colleges are using the instrument, or some modification of it, as a test-out instrument, because they have information competency graduation requirements at their schools.
>
> They're using it in their own ways. We intended it that way right from the get-go. As long as people read the test specification document, they'll have a lot of guidance on how to adapt it and modify it.[22]

James Madison University Information Competency Exams

James Madison University (JMU) has a strong historical focus on assessment, in general, that emanates from its Center for Assessment & Research Studies. JMU offers a Master of Arts Program in Psychological Sciences that has a concentration in quantitative methods (assessment, measurement, & statistics), as well as a Doctoral Program in Assessment and Measurement for more advanced study.[23]

In the middle to late 1990s, JMU was going through a general education program review and revision process. Two assessments related to information fluency were created from that process for what's called "The Human Community," which comprises the core academic program required of all students at JMU today, regardless of their major or professional program.[24]

The first required test is the Tech Level 1 test, which must be completed by the end of a JMU student's first semester. The second required test is the Information Seeking Skills Test (ISST), which must be completed by the end of a JMU' student's second semester. Both are multiple-choice, performance-based tests. The Tech Level 1 test is a software capabilities test that measures a student's proficiency in Microsoft Excel, Word, and PowerPoint. The ISST test is an information-seeking competencies test that has students demonstrate their ability to identify and locate library services and collections, formulate and conduct an information search using a variety of references, evaluate information, employ efficient database searching techniques, identify bibliographic elements and cite properly, and apply ethical guidelines when using information. [25]

Test results for the 2005-06 academic year showed that about 3,500 incoming JMU students took both tests. For the Tech Level 1 test, 48 percent passed the Excel section, 40 percent passed

the Word section, and 94 percent passed the PowerPoint section, On the ISST test, only 86 students failed. 26 A Web-based instruction program, called "Go for the Gold," as well as various course-related assignments that students participate in during their first year, are geared toward helping students pass the ISST test. [27]

About three years ago, the ISST test became the basis for a commercial version offered by JMU's Institute for Computer-Based Assessment and the Center for Assessment and Research Studies. Called the Information Literacy Test (ILT), it measures standards 1, 2, 3 and 5 of the ACRL Information Literacy Competency Standards for Higher Education. Pricing is $5 to $10, depending on the number of test takers.[28]

From Assessment to Across-the-Curriculum Practice

As noted, the aforementioned assessments are being utilized to acquire both individual and group scores, depending on the test, that reveal various levels of student information fluency competencies. In addition, the data collected from any of these assessments, or from any information-fluency-related assessment, can be a jumping board for the early development of initiatives that can bring together students, faculty, staff, and administrators under the umbrella of a sustainable across-the-curriculum information fluency program. What follows are three examples of institutions with across-the-curriculum information fluency initiatives that have a variety of assessment measures and strategies.

University of Central Florida

The University of Central Florida's (UCF) "Information Fluency Initiative" was born out of its Quality Enhancement Plan (QEP) for a recent Commission of Colleges of the Southern Association of Colleges and Schools reaffirmation of accreditation. It is an example of a large-scale project to infuse information literacy across the curriculum. It was officially launched in August 2006, and its early progress will be partially determined by a variety of information fluency assessments.

UCF has an innovative and established assessment system that flows out of three campus units:

- Operational Excellence and Assessment Support (OEAS): OEAS provides "support to all administrative units and academic programs through integrated processes that include continuous quality improvement, survey development, data collection, analysis, and guidance in assessment."[29]
- The Faculty Center for Teaching and Learning (FCTL): FCTL "provides workshop and one-on-one assistance to faculty members and administrators on course, program and college assessment, and the integration of effective pedagogies that support student learning." FCTL works in collaboration with OEAS by offering workshops and consultations, covering course and program assessment .with UCF teaching and student support units.[30]
- The Research Initiative for Teaching Effectiveness (RITE): RITE provides leadership and support to faculty members across campuses who are conducting research in effective pedagogy, much of which concentrates on information fluency."[31]

In the Fall 2006 semester, the Information Fluency Initiative officially kicked off inside four pilot programs: the Philosophy Department, the School of Nursing, a freshmen-level Strategies for Success course, and the UCF Burnett Honors College. Each of these pilots has its own assessment strategies that entail collaborating between faculty, information literacy specialists from the UCF libraries, FCTL, and OEAS to identify and develop information-fluency-related student learning outcomes (SLOs) and measures inside key courses, and to revise these SLOs and measures continuously through regular review and approval processes. 32 Based on data they will have collected and analyzed through assessments, all four pilots will ultimately embed solid SLOs in a variety of their courses before the Fall 2009 semester.

In the Philosophy Department the focus is on improving critical thinking skills of students in its ethics program. In the School of Nursing the focus is on increasing training to help students evaluate and determine what research and information is most effective in their day-to-day work as health care specialists. 33 The Strategies for Success course is an optional one-credit freshman-orientation course that typically enrolls as many

as 2,000 students each year. An information-literacy-related assignment has been embedded within this course where students must conduct research on three events from the year they were born and write a paper on how those events have shaped their lives. The exercise is geared toward building information literacy skills from both critical thinking and technical perspectives. 34 The Burnett Honors College attracts about 480 academically successful freshmen each year. The incoming class for 2006-07 had an average SAT score of 1350. The average SAT scorer for the entire UCF campus student body is 1180. The Burnett Honors College, which serves all disciplines and majors at UCF, plans to introduce information fluency components to its freshman symposium curriculum, which is the cornerstone of the 4-year Honors College experience that is required for its incoming students each Fall semester.[35]

From the Perspective of UCF's Honors College

Similar to all the pilots currently in progress at UCF, the Honors College's goal is to help freshmen students get on a fast rack to understanding the basic tenets for finding and evaluating information, as well as for building their technology skills. By the time they enter their junior year, these students should also be on a solid pathway that significantly enhances their information fluency critical thinking skills.

In its first year of implementation during Fall 2006 the College is collecting baseline data concerning students' perceptions and attitudes about information fluency (e.g., how familiar are you with library databases), as well as administering several quizzes that are cognitive in nature, (e.g., identify key words for a specific query and use them in a variety of databases). In the following year the College plans to utilize the same assessment tools and compare the results to fine tune these early assessments for the next administration. Additionally, the ETS ICT Literacy Assessment will be administered to about 10 percent of the Honors College students in order to collect more data about these students' information fluency skills. Another component of the College's information fluency assessment strategies will analyze how students learn how to use their course management system, which will be accomplished through a test provided and administered by WebCT. It is considered that learning how to navigate effectively through a CMS is itself an information fluency technology skill that students must master.[36]

Finally, once information-fluency-related SLOs have been fully developed through analyzing the assessments from all current and future pilots, it is expected that faculty throughout UCF will eventually incorporate information fluency pedagogies into their courses.

> We do not own our faculty, so we cannot tell our faculty what to do. All we can hope for is to create this culture and encourage them to infuse it in their courses. We cannot impose information fluency within our general education courses. We can put it in the [Honors College] symposium, and we can encourage faculty who teach interdisciplinary seminars [which is another component of the Honors College] to infuse it, or to use it as an important part of what they are teaching, but that is about it.[37]

The UCF Information Fluency Initiative Web site has a downloadable PDF document addressed to students that has the following question and answer that succinctly places this initiative within its proper context:

> Why do I need to be information fluent?
> Information fluency is vital to university students' academic achievements and professional successes and will contribute to their lifelong learning processes. Information fluent students are valuable to employers and corporations as they move beyond the university environment into the workplace. The ability to extrapolate useful concepts and ideas from existing information into new applications continues to be a crucial skill in the 21st Century work place.[38]

Philadelphia University's Budding Infrastructure

Philadelphia University, a relatively small private institution with a little more than 3,000 students-and obviously very much unlike the much larger state institution UCF with more than 45,000 students-has also built a sophisticated infrastructure for preparing its students to be information fluent.

The Information Literacy Project at Philadelphia University (PhilaU) started in Spring 2000 as a discussion among PhilaU's Teaching Learning and Technology Roundtable (TLTR), 39 which is a group of faculty and staff whose mission revolves around "providing students with the technological skills for career success and lifelong learning." 40 Detailed information about PhilaU's Information Literacy Project is published on a special Web site that includes its history and mission, along with access to documents and resources for students, faculty and staff.[41]

The PhilaU Information Literacy Project is a course-integrated and interdisciplinary-based initiative currently being built on a framework in which solid information-fluency-related student learning outcomes have been identified and published across freshmen, sophomore, junior and senior levels.[42] To implement this initiative, librarians, faculty, and staff are working in partnership, with faculty taking ownership for developing courses, to incorporate information fluency pedagogies that are in line with the already-created student learning outcomes. The PhilaU administration recognizes the importance of the Information Literacy Project and encourages faculty to get on board.

Six PhilaU Schools Adapt to Information Literacy Project Frameworks

Each of Philadelphia University's six schools is utilizing a combination of instruments and methods to assess the information fluency competencies being reached by their undergraduate students. Thus far, assessment measures are defined primarily in the context of assignments, such as written papers, oral presentations and capstone courses and projects, along with various other measures such as student portfolios and pre and post multiple -choice, short answer and true/false tests. None of the six schools are utilizing any of the assessment tools described earlier in this paper as they create and modify their own assessment instruments internally.[43]

The School of Liberal Arts (SLA) is a good example of the emphasis that is being placed on developing information-fluency-related skills in a variety of courses. SLA faculty, with help from PhilaU librarians, have built an array of assignments, rubrics, assessment grids, faculty guides and student learning outcomes adapted from the Information Literacy Project frameworks and goals.

Writing Seminars with Information-Fluency-Related Outcomes

For example, a Writing Seminar I course, offered through the College Studies Program, requires students to

- learn how to access, and become familiar with, the campus library Web site;
- use electronic tools to locate information, including accessing electronic databases;
- understand citations and learn how to "select and integrate quotations and to refer to and paraphrase from sources;" and,
- under the heading of 'critical thinking and evaluation of information,' practice evaluating primary and secondary sources of information.

In addition, faculty who teach Writing Seminar I are "strongly encouraged" to integrate information technology into their course design by, at least, communicating with students via e-mail and creating a course website through PhilaU's course management system, Blackboard.[44]

Students in the Writing Seminar II class are further required to

- perform online searching at a basic to intermediate level;
- use literatures of selected disciplines and professions;
- demonstrate effective and ethically responsible use of a range of print and electronic resources; and
- demonstrate efficient, responsible, and appropriately creative use of available information technologies.[45]

One PhilaU educator summed up the Information Literacy Project from an instructional standpoint as follows:

> It's not just coming to class and explaining to them how to use a database and what buttons to push so that they'll be able to do that. We're trying to help students over the course of four

> years develop a whole range of skills so when they graduate they will have this ability to find, evaluate and present information.[46]

UC Berkeley's Fellowship for Undergraduate Research

In 2001, UC Berkeley began to pinpoint their teaching and learning initiatives around helping educators and students enhance their information literacy skills in a research-based learning environment. This effort took a stronger foothold in July 2002 through a $138,000 two-year grant from the Andrew W. Mellon Foundation – titled the Mellon Library/Faculty Fellowship for Undergraduate Research – that had the primary focus of

> redesigning courses across disciplines, reenergizing large enrollment courses, and enabling students to develop their information literacy and critical thinking abilities within and outside the formal classroom.[47]

As UC Berkeley educators participated in the Fellowship for Undergraduate Research, it became obvious, particularly to the academic librarians involved in this grant, that the skill sets needed to bring research-based learning into any given course were typically based on information literacy outcomes and standards as defined by ACRL.[48] However, at a high research institution such as UC Berkeley, the word "research" resonates with faculty and administrators more effectively than the words "information literacy" or "information fluency."[49]

In December 2003, UC Berkeley was awarded another $749,000 by Mellon to further enhance and develop the Fellowship for Undergraduate Research project over the next four years through 2007.[50]

At the heart of the Mellon initiative is a re-conceptualizing of the library's role, where

> librarians and faculty are envisioned as partners in the effort to address challenges such as developing refined research skills among students who increasingly rely on open Internet search engines as the sole research strategy, increasing students' awareness of academic scholarship and library collections overall, and positioning information literacy and research skills in courses as appropriate to the level of student and nature of the discipline.[51]

Much of the continuous development of the Fellows for Undergraduate Research project lies in the high levels of collaboration occurring between the campus administration, the library administration and the faculty and support units from the academic side of UC Berkeley.[52]

The early process for getting UC Berkeley educators involved with the Fellows for Undergraduate Research project begins with the Vice Provost for Undergraduate Education and the Mellon Project Director who "meet with chairs from targeted departments to gain a deeper understanding of how undergraduate research and information literacy are-and could potentially be-embedded into their curricula, and to elicit recommendations for specific courses as well as instructors who would be promising candidates for the Fellowship." [53]

One-year Fellowships are awarded to thirteen UC Berkeley faculty each year who are deemed as "change agents who would impact a broader community of peers." The Fellowship begins with a three-week "Institute" held in early summer where the Fellows meet with librarians, and staff from the Graduate Student Instructor Teaching and Resource Center, Educational Technology Services, the Office of Educational Development, and the Division of Undergraduate Education. The Institute exposes faculty to "concepts and teaching methods in support of research-based learning and emphasizes an exchange of ideas with peers and academic partners instead of formal lectures." For the actual redesign of their courses, each Faculty Fellow works with an implementation team comprised of a librarian, an educational technologist, and a staff member from the Graduate Student Instructor Teaching and Resource Center for one year.[54]

There is an assessment component in which an assessment consultant was assigned to three implementation teams to work on developing methods and tools that could be applied to other courses. This part of the project is attempting to build support with the goal of having Faculty Fellows assess student learning in order to help inform their class as well as inform their students.

Assessment instruments from outside suppliers, such as those described earlier, are currently not being used in the Fellowship for Undergraduate Research project. In addition, an evaluation consultant was hired to evaluate the entire project primarily through obtaining feedback from all of the project's participants.[55, 56, 57]

Overall, the Fellowship for Undergraduate Research has been successful.

> In the past three years, 35 faculty representing the sciences, social sciences, and humanities have participated in the Mellon initiative. Collectively they have redesigned 33 lower-division and upper-division courses to include research components influencing nearly 8,000 students. Through their experiences as Mellon Faculty Fellows, many faculty have been inspired to incorporate research-based learning and information literacy development into other courses they teach. Additionally, through formal events and informal conversations, these faculty members continue to spark interest in research-based learning among colleagues on campus, providing a form of grassroots publicity and increased credibility for the initiative.[58]

Conclusion

When looking closely at all these assessment and across-the-curriculum activities it becomes clear that helping students become information fluent cannot be accomplished in one semester, or in one class. Additionally, while portions of information-fluency-related assessments and pedagogies can be integrated throughout a student's academic career, enhancing students' information fluency skills is not purely an academic concern. Information fluency is a lifelong learning issue that starts in K-12, through higher education, and into the workplace and our personal lives.[59]

In short, all of the skills that revolve around the notion of being information fluent have become critical life skills today. We understand that to succeed academically students need to have technology skills, information literacy skills, and critical thinking skills at a higher level than they have in the past.[60] Many colleges and universities recognize this and are reforming curriculums, course by course, to ensure that students of all ages and disciplines are gaining knowledge about both basic and advanced tools and strategies that fall under the information fluency domain. How prevalent of a reform movement within this context has yet to be fully determined, but it seems safe to say that information-fluency-related initiatives have certainly gained significant prominence in recent years at colleges and universities across the country.

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