The Digital Divide and Higher Education: Curriculum, Technology Literacy, and Change

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Introduction

The *Southern Regional Education Board* of the United States (US) recently published a bulletin reporting adults with a bachelor's degree will earn anywhere from 82% to 99% higher annual incomes than adults with a high school diploma making an average annual income of $23,000 to $26,000 (SREB, 2006). The difference in annual incomes can be a differential of over a million dollars in a lifetime. In a capitalistic and democratic nation like the United States, this monetary difference can substantially add to the quality of life for an individual and family. The individual monetary benefit of an earned bachelor's degree is significant, yet the potential extends past the mere monetary value afforded by higher education. The report also demonstrates that adults with an earned bachelor's degree have statistically significant better health, are engaged in more civic involvement, and are have time for more leisure activities than adults without formal higher education (SREB, 2006).

From the perspective of a nation or more broadly a society, the benefits afforded to the individual can be linked to positive economic and social externalities. These positive externalities are outcomes that are desired by society as opposed to negative externalities like pollution or homelessness that are often unintended consequences associated with individual and group behaviors. The *Southern Regional Education Board Bulletin* loosely connects individual benefits of higher education to those positive effects on a nation, which include increased tax revenue, consumption, productivity, employment, charitable giving, and overall quality of life (SREB, 2006). Though these benefits paint a picture about the benefits of higher education to an individual and to a society, they fail to explain the purpose higher education and the behavior of higher education as a living organization. A venture into the historical research literature of education is powerful starting point.

Higher Education Perspective

The benefits of a higher education are great, but these benefits alone do not explain the role of an education to society or to an individual. Theory is a requisite for meaningful explanations. Turner (1960) suggests the US education system is built upon a system of contest mobility, suggesting that adults secure higher education as a means of elevating social status by exercising the "right" ingredients (i.e. motivation and ambition). This system is in contrast to a system of sponsored social mobility, in which an adult is sponsored for entrance into higher education or a different social class by an elite controlling class, which, as described by Collins, is used in English education system. In a system of contest mobility, the underlying themes are social stratification and social mobility, in which, "the elite status is a prize in an open contest" (Turner, 1960, p.855). Using Turner's explanation, higher education is a means to upward social mobility for an individual.

Turner (1961) explains that "in sporting events [contest mobility], there is special admiration for the slow starter who makes the dramatic finish" and that rules are placed in the system to assure the premature judgments are not made. In context, the US higher education system is a tool built and shaped to express the cultural norms of society at large, and establishes and interprets the criteria for elite status of an individual. In short, the US university functions like a contest: "standards are set competitively, students are forced to pass a series of trials each semester and only a minority of the entrants achieves the grand prize of graduation" (Turner, 1961, p. 863).

Following this line of thought, it is germane to note that participation in higher education has signifigantly increased in the United States since World War II (Hardwick Day, 2006). Shortly after World War II, citizens of the United States experienced the effects of increased educational expectations to gain employment (Collins, 1971). A high school diploma was no longer satisfactory for entrance into higher-end careers. The United States, considered an advanced industrial society at that time and now in the information economy, had raised the education expectations for employment.

Collins (1971) attempts to use two bipolar theories to explain the amplified educational expectations of employers: technical-function theory, and conflict theory. Using the technical-function theory, these increased expectations reflect the demands for greater skills and knowledge due to technological change. In contrast, conflict theory posits that these expectations reflect the efforts of an elite status group monopolizing a career by imposing cultural standards on the selection process. Neither theory fully explains the change in society, but the underlying variable is that higher education is an expectation.

School-To-Workplace Transition: To complicate matters further, the transition from high school to the workforce and even higher education to the workforce is an unclear and sometimes difficult process for graduates. Rosenbaum, Kariya, Settersten and Maier (1990) use a number of theories to explain the phenomena in the context of high school graduates seeking entrance in the workforce. While Rosenbaum and his colleagues specifically discuss high school transition, higher education may also apply these theories since the two types of institutions share elements in common. Further, the explanations further escalate the critical role of higher education. These theories include the segmented market theory, human capital theory, signaling theory, and network theory.

The segmented labor market theory suggests that the labor market is stratified into a primary market and a secondary market. The primary market is characterized by good working conditions, job security and advancement opportunity, while the secondary lacks these characteristics and does not reward employees for skills and performance (Rosenbaum et al., 1990). The theory contends the segmented nature of the labor market helps employers control workers and youth cannot easily ascertain jobs in the primary market (Rosenbaum et al., 1990). This theory helps to explain why individuals without a college degree may find it difficult to ascertain employment.

Human capital theory takes a different position, contending that individuals lacking a college education may lack the necessary knowledge and skills to perform in the workplace. Thus, the deficiency is assigned to those people without a proper education or training, or just lacking capacity to function effectively in the workplace as oppose to assigning the deficiency to the employers securing control of employees. The theory is based on the market model, which assumes that people compete for employment in free markets and the more valuable people are paid more (Rosenbaum et al., 1990). Rosenbaum and his colleagues (1990) suggest that human capital theory is limited in that it does not recognizes the costs of obtaining information or limits on its availability and usefulness.

Signaling theory compensates where human capital theory falls short. It explains the economics of labor market decisions being based on limited information, referred to as signals, because of the high costs involved with ascertaining employment information (Rosenbaum et al., 1990). Thus, employers interpret signals like age, sex, race, school prestige, certifications, et cetera and apply what they have learned from previous hiring experiences to make informed employment decisions. The theory helps shed light on why employers place emphasis on simplistic measures for employment decisions. It is pointed out that more information would be collected, such as college transcripts, if the benefits are found to outweigh the costs.

The final theory used to explain school to workplace transition is the network theory, which suggests that educational institutions, secondary and post-secondary, should build stronger relationships with business and industry. Market theories would suggest that such relationships might interfere with the market place transition, while the network theory suggests that these institutional linkages increase efficiency and strengthen relationships by providing meaning and trustworthy information.

Digital Divide and Knowledge Work: The Need for Change

The purpose of the previous theoretical explanations sets a framework for a much larger discussion. The previous discussion outlined the importance of higher education to both individuals and society, and theories to explain the US higher education system, the increased higher education expectation in the US workforce, and the complex school-to-workplace transition process. The previous theories used to explain these phenomena are still applicable to the higher education system, but the existing explanations are insufficient because our nation has risen to the status of an information economy.

US citizens have experienced the dramatic growth of the Internet and its related technology (Kranzberg's second law: invention is the mother of necessity) over the past several years. However, the levels of awareness and use of these new technologies are disparate, usually divergent on a number of troubling demographics like social class, race, education, nationality and even gender. To illustrate, poor and minority families in the US are less likely to have access to a computer, the Internet and less likely to have the necessary skills and knowledge to meaningfully use these resources, resulting in a system of unequal access and productive participation in the information economy (Attewell, 2001).

The major disparity between the "information haves" versus the "information have nots" has come to be referred to as the *Digital Divide*. However, as pointed out by Cuban (1986) in landmark text *Teachers and Machines: The Classroom Use of Technology Since 1920*, having access to computing resources is not sufficient if the technology is not meaningfully integrated into the curriculum. Though usage is contingent upon accessibility, they are two distinct concepts.

The compelling question to ask is whose responsibility is it to fill the deep, broad and dark void of the digital divide and what procedures can be taken to accomplish this overarching goal. Politicians and philanthropists alike have raised awareness and monies to spearhead this growing problem (Attewell, 2001). Both have turned to the education systems in the US as a means to fill this void. Despite the education system's best efforts to address the digital divide, the divide still exists in varying social classes and minorities. More disturbingly, even our students within the higher education system lack the technological literacy skills necessary to complete college-level assignments efficiently or successfully, according to a new assessment by the Educational Testing Services (ETS).

ETS reports that many undergraduate students are "lacking the critical thinking skills necessary to perform the kinds of information management and research tasks necessary for academic success" (ETSICT, 2006). The results of ETS's findings pose a serious problem for professionals in higher education. The nature of work in the US has dramatically changed in the past 10-years from industrial work to knowledge work. Further, the preponderance of careers in the information economy is classified knowledge work, a term coined by the famous management scholar, Peter Drucker in 1959. Drucker had observed the growth in the number of careers centered on information.

A knowledge worker is one who works primarily with information or one who develops and uses knowledge in the workplace. Knowledge workers are now estimated to outnumber other workers in the US by at least a four to one margin (Haag, Cummings, McCubbery, Pinsonneault, Donovan, 2006). The US is recognizing the need for information and technology literate workers who are prepared to use both information and technology to accomplish organizational goals.

The technical-function theory would suggest the responsibility of preparing tomorrow's knowledge workforce using today's resources again falls into the hands of the US higher education system. The increasing educational expectations of the workforce reflect the need for technology and information literate knowledge workers by business and industry. Complementary to this explanation, the human capital theory would posit that employers will be in need of a workforce with greater skills and knowledge to function in the workforce, obviating the need for a college education that includes information and technology literacy.

Signal theory might suggest the increased importance of easily accessible employment indicators, such as industry or proprietary certifications in the use of technology. Network theory would suggest stronger ties between institutions of higher education and business and industry to improve market efficiency. Clearly, the theories of our previous generations still can be characterized by apt explanatory power in an information economy, with the exception that the context has dramatically changed.

The importance of meeting the needs of the information economy can be best explained by patronage. Institutions of higher education in the US serve a wide array of patrons with students being one among many. Lowen's (1997) case study of Stanford University, *Creating the Cold War University*, demonstrates the patronage to many other stakeholders, which include the federal government, the military, and business and industry. The strong ties between a university like Stanford and key industries and multi-national businesses extend past feeding competent students into the workforce, though this is an important aspect of the relationship. US universities have skilled research faculty conducting extensive industrial research, and the monies generated by these relationships pay major overhead dividends to the universities for operation costs. Consequently, universities have an obligation to respond to business and industry needs or run the risk of loosing large incoming revenues from one of their primary patrons.

So, how do we interpret this information? The increased educational expectation posed by business and industry indicates the need for a necessary change in higher education in response to the stark changes in the nature of work. The information suggests the need for curriculum change in the broad scope of a university education, what one might call a general education. The term general education can mean different things to different people. To provide an operational definition, the term general education will refer to a program of courses generally taught in the arts and sciences to provide students with a broad educational experience. Traditional general education will often include courses that are introductory in nature and provide students with fundamental skills and knowledge in mathematics, English, art and humanities, and physical, biological and social sciences. The change in university curriculum should incorporate the skills and knowledge to prepare graduates to be technology and information literate.

Curriculum Change: Technology and Information Literacy

The process of formalizing a general university education is a trying political process as best described by Cuban (1999) in *How Scholars Trumped Teachers: Constancy and Change in University Curriculum, Teaching, and Research, 1890-1990.* Cuban describes the constancy and deliberate change in a case study of Stanford University. The official undergraduate general education curriculum had been revised several times at Stanford University since its inception in the 1800s; once in 1920, once in the 1950s, in the 1960s, and in the 1990s. Each attempt of revising and formalizing the general education was accompanied with a variety of organizational changes and leadership challenges. In some cases, the curriculum change efforts would cause bitter arguments among faculty, administration, students and even Stanford alumni.

The first major change to the official curriculum in the 1920s was driven by the current President of Stanford University, Dr. Ray Wilbur and a panel of five faculty sub-committees assigned by Wilbur. Wilber was adamant about making the curricular revisions to and expressed his views accordingly (Cuban, 1999, p. 23):

> *"It seems to me that now student in the so-called classical or humanities curricula should graduate from a university without some laboratory experience in gathering information firsthand… Nor should any science or engineering or medical student graduate without a good working knowledge of cultural, social, and economical forces upon which the demand for his professional services and his quality as a citizen depend."*

Wilbur's position is what is often referred to as a belief in a university education being a "well-rounded" educational experience, rather than merely focusing on the technical skills or knowledge of a specific domain. The panel Wilber created investigated and deliberated over the general education curriculum over the following year. The Academic Council and faculty of Stanford University accepted the changes and swiftly integrated the new curriculum recommendations. The revised curriculum required coursework in English, foreign languages, natural sciences and history as well as a number of survey courses students could choose from as electives.

The second major undergraduate curriculum revision at Stanford University did not evolve as swiftly and painlessly as the first major revision. President Sterling, the new President of Stanford University had driven the next initiative. The compelling difference from this initiative was that undergraduates could engage in the general education courses all four years as opposed to the first two years and that students could take mathematics courses in lieu of language courses. The subsequent general education revisions at Stanford University were also characterized by organizational changes: the converging and diverging of academic disciplines and departments. A handful of faculty members had a very different position and perspective about the curriculum change process at Stanford. Dr. Spenser Johnson (1998) would describe the process curriculum revision as somebody "moving their cheese", speaking to sometimes unwarranted or simply unwanted change.

General Education at the University of South Florida: To fast forward to the present day, we can see a more recent example of the importance of general education curriculum revision at the University of South Florida (USF). USF has instituted the *General Education Council* to revitalize the curriculum by implementing the "Foundations of Knowledge and

Learning Core Curriculum to improve undergraduate education by infusing more inquiry and critical thinking into our [USF] University curriculum" (GenEd, 2006). The general education curriculum at USF is now defined by a number of scholarly dimensions and core areas, such as critical thinking and inquiry as dimensions and mathematics as a core area, which must be addressed within general education courses. Each course classified as general education must undergo a rigorous certification process that requires each course to integrate four or more dimensions, of which, critical thinking and inquiry are required.

Unsurprisingly, one of the dimensions available is information literacy, which states a general education course with this dimension must demonstrate how "information is created, organized and used" and the "ethical and legal issues in the creation and use of information" should be emphasized in general courses adopting an information literacy dimension (GenEd, 2006). Cuban (1999) might characterize the USF general education curriculum revision by breadth and fundamental change. The change is fundamental in that it is aimed at the core beliefs, behaviors and structures of the institution and broad because it impacts the entire institution since all undergraduates must enroll general education courses.

Though the USF general education curriculum addresses information literacy, the curriculum still lacks a dimension addressing technology literacy. Few institutions of higher education have a formal computer technology course as a requirement in the general education. Rather, these types of courses and this type of curriculum are required for specific degree programs, such as a degree in education requiring an introductory educational technology course or a degree in business requiring an introductory computer applications course in the state of Florida. More interestingly, the technology literacy curriculum is taught in multiple disciplines depending on the institution.

At glance at USF's curriculum will show a number of different computing and information degree programs and courses. At USF alone, in terms of broad computing and information science curriculum, the institution offers undergraduate and/or graduate degrees in computer science, computer engineering, management information systems, information technology, library and information sciences, instructional technology and even bioinformatics. Each of these degree programs incorporate similar curriculum. Listing the different course titles and descriptions in each discipline for courses that use the similar computing technology, such as spreadsheets, for similar educational or practical applications is outside the scope of this paper – not to mention it would occupy more than three 8.5 x 11 pages. The point to be made is that multiple disciplines teach similar content within the same academic institution.

In some cases, the courses will even utilize the same textbook, but use a different title for the course to make it specific to a discipline. For example, a college of business uses the title "Computer applications for business" as opposed to a "Microcomputer applications" course taught by a college of computing and engineering at the same institution. These courses will often use the same textbook, have the same types of assignments and be instructed using the same software packages. The only substantial difference is that it is taught in a different college by a different faculty member.

Organizationally, the fundamental question is which academic discipline would reserve the right to teach an introductory computing technology course to satisfy a potential technology literacy general education requirement. Though a simple question, this type of problem (turf wars), is essentially the cause of what Cuban (1999) called narrow scope changes, over time, transforming into broad scope changes or changes that were intended to become incremental, transforming into fundamental change for an institution. This problem would likely cause unnecessary inter-departmental struggles over the enrollment afforded to a single department since all undergraduate students would theoretically enroll in such a course.

The likely solution to such a problem would probably include the creation of a curriculum task force. First the task force would define the dimensions of technology literacy and subsequently would select a set of courses instructed in multiple disciplines for consideration. Each of these courses would have to be approved by the same task force curriculum committee to satisfy the technology literacy requirement. Though there would likely be redundancy in the curriculum between disciplines, this approach would likely diminish the campus politics. This line of though leads to the next conversation topic, what defines technology literacy and what skills and knowledge does it encompass.

Technology Literacy in Higher Education

The technology literacy is a multidimensional construct, encompassing many different concepts and perspectives. The US Department of Education (1996) defines technology literacy as "computer skills and the ability to use computers and other technology to improve learning, productivity, and performance" (ETSICT, 2006). ETS refers to the construct as information and communication technology (ICT) literacy and defines ICT literacy as "the ability to use digital technology, communication tools and networks appropriately to solve information problems in order to function in an information society" (ETSICT, 2006). ETS suggests technology literacy includes the ability to use technology "as a tool to research, organize, evaluate and communicate information, and the possession of a fundamental understanding of the ethical and legal issues surrounding the access and use of information". Their recent published report and their assessment of the current status of undergraduates is based on this definition and an assessment instrument built to operationalize the construct.

However, the current definition of technology literacy has undoubtedly evolved over time as the social and technological factors have also evolved. As pointed out by Ceruzzi (2005) and Williams (2000), the term technology has been transformed in society to automatically be interpreted as something involving digital computer technology, as opposed to a mechanical device such as a coffee grinder or processes such as logistical functions being defined as a form of technology. With this in mind, the ETS definition of ICT literacy is more precise and meaningful as an operational definition because it clearly defines the role and type of technology as opposed to the broad definition provided by the US Department of Education.

Kranzberg (1986) can provide ample guidance from his years of inquiry in the relationships between a society and technology. Kranzbeg's work is also relevant to the discussion of technology literacy. Kranzberg's first law: "technology is neither good, nor bad; nor is it neutral" (Kranzberg, 1986). In context, the making determination of which technology skills and knowledge (eg., spreadsheets, word processing) as well as selecting the specific technology (eg., Microsoft, Open Office) used in the curriculum must be viewed from this perspective. Kranzberg uses the example of DDT; the infamous pesticide was swiftly removed from the US market because of its adverse effects on the food chain. Meanwhile, the same pesticide saved millions of lives in India because it increased the food supply, which was more detrimental to the nation than preserving the food chain.

While one adverse affect of selecting the Microsoft ® Office suite as the technology to use for computer literacy instruction in higher education is that public dollars are now supporting a multi-billion dollar monopoly, this particular technology is also the most frequently used Office Suite in business and industry. There is a legitimate concern that higher education will sell itself to the broad technology industry (Noble, 1998). To determine whether a specific technology is a positive attribute in society is often contingent upon the context of the environment – it should be culturally accepted.

Kranzberg's fourth law is also pertinent to the discussion: "although technology may be a prime issue in many public issues, non-technical factors take precedence in technology policy decisions" (Kranzberg, 1986). This law especially rings true in the context of higher education. The previous discussion about selecting and approving which courses within an institution of higher education would satisfy a technology literacy component would likely weight the non-technical factors more than the technical. Kranzberg's fourth law also applies to the determination of what defines technology literacy at an institution and the process of selecting technology to implement this definition. The ensuing discussion highlights the potential curriculum of a technology literacy course for general education.

Filling the Void with Higher Education: Technology Literacy

So, what does it mean to incorporate technology literacy into higher education as a general education requirement? Before the concept of technology literacy can be incorporated into existing general education curriculum, an institution of higher education must first operationally define the construct to satisfy the interested parties (business and industry, faculty, administration). Williams (2000) points out, citing a similar type of process at the Massachusetts Institute of Technology where an enterprise resource planning system was integrated in opposition to the culture of the institution, an initiative like this one forces stakeholders to converge on their positions. Thus, an institution must include the perspective of business and industry in defining technology literacy. For example, many institutions of higher education and specific departments will form advisory panels composed of various business and industry leaders in the strategic planning process.

How do we characterize technology literacy? Many organizations have attempted to provide clear behaviors that exhibit the construct. The ETS technology literacy assessment is composed of seven distinct constructs: define, access, manage, integrate, evaluate, create and communicate (ETSICT, 2006). Another similar instrument is the Georgia Technology Literacy Toolkit, which defines five similar constructs: assessing, managing, evaluating and analyzing, integrating and synthesizing and communicating information (GTLAT, 2006). Both definitions converge on the meaningful use of technology.

Table 1 provides more detail about each of the factors used to define technology literacy according to ETS. The ETS factors encompass a number of different activities that characterize technology literacy: finding and searching digital libraries, browsing websites, using Boolean conditions to refine a search results, downloading and installing software, assessing the credibility of an electronic source, composing emails, basic word processing skills, basic spreadsheet skills, and many more observable behaviors (ETSICT, 2006).

Table 1. Factors that define technology literacy (ETSICT, 2006).

Factor	**Definition**
Define	The ability to use ICT tools to identify and appropriately represent an information need.

Access	The ability to collect and retrieve information in digital environments. This includes the ability to identify likely digital information sources and to get the information from those sources.
Manage	The ability to apply an existing organizational or classification scheme for digital information. This ability focuses on reorganizing existing digital information from a single source using existing organizational formats. It includes the ability to identify existing organization schemes, select appropriate schemes for the current usage, and apply the schemes.
Integrate	The ability to interpret and represent digital information. This includes the ability to use ICT tools to synthesize, summarize, compare and contrast information from multiple digital sources.
Evaluate	The ability to determine the degree to which digital information satisfies the needs of the task in ICT environments. This includes the ability to judge the quality, relevance, authority, point of view/bias, currency, coverage or accuracy of digital information.
Create	The ability to generate information by adapting, applying, designing or inventing information in ICT environments.
Communicate	The ability to communicate information properly in its context of use for ICT environments. This includes the ability to gear electronic information for a particular audience and to communicate knowledge in the appropriate venue.

How should the work of instructing technology literacy be organized within a university structure? Baron and Bielby (1980) discuss the organization of work in higher education and the level at which it should be studied. This problem was previously discussed by providing two hypothetical scenarios. The first scenario is involved one academic discipline within an institution rightfully bearing the responsibility of instructing technology literacy. However, as previously discussed, there is already tremendous redundancy in the university curriculum surrounding introductory technology literacy courses. A likely outcome of this first scenario would result in turf wars across academic disciplines vying for enrollment and unnecessary politics.

The second scenario included a committee defining technology literacy for the institution by incorporating other stakeholder interests (business and industry) and approving a set of courses that meet the technology literacy requirements at an institution. This scenario could potentially bypass the political ramifications that would stem from electing one academic unit to cover the curriculum.

A third scenario would be to incorporate technology literacy across the general education curriculum, much the same way USF instituted a number of dimensions for each general education course. However, the third scenario would require a tremendous amount of communication between departments to assure the technology literacy factors included in the curriculum meet technology literacy requirements with minimal redundancy. This is also an unlikely scenario. A fourth and suggested scenario is an amalgamation of the second and third. An institution would define technology literacy, select a set of courses that meet the criteria and encourage inter-departmental communication for technology literacy across the curriculum.

Does creating a curriculum for technology literacy address the digital divide? This question is probably outside the scope of this short paper. However, this paper did bring to light undergraduates, anticipated to be technology-savvy by higher education professionals, may lack the appropriate technology and information skills and knowledge to be successful players in the academy and the workforce: the digital divide may be interpreted more accurately as a gap in skills and knowledge as oppose to a gap in access of information and computing resources. Having access to a resource does not mean an individual can meaningfully use the resource.

Closing Thoughts

Higher education in the US should not be characterized as a system of contest mobility as described by Collins, nor should it be described as a system of sponsorship. Collin's (1971) characterization is apt at describing higher education as a means to upward social mobility, but the explanation falls short when describing the involvement of students and other key stakeholders in higher education. The purpose of higher education to a student is learning and preparing to enter the workforce as a productive employee and society as an informed citizen. Though competition can be embedded in the learning process, it is not the sole purpose of the US higher education system.

This essay has emphasized the nature of higher education regarding theories to explain school-to-workplace transition. In an information economy, the three most relevant theories would include the human capital, signal and network theories. The human capital theory, as pointed out by Rosenbaum and his colleagues, does not account for the cost of employment information. Signal theory recognizes the cost of ascertaining information for employment decisions, while the network theory supports strong ties between institutions of higher education and business and industry. We can see these theories in operation when an institution includes business and industry leaders on advisory boards for curriculum recommendations or when a business uses certifications like the A+ certification as a signal to inform employment decisions. Lowen (1997) describes the importance of university and patron relationships: business and industry are one of the primary patrons.

With the evolution of the nature of work and the increased importance of information and technology literacy of the entire workforce, it would appear that higher education is falling behind in preparing tomorrow's workforce. Knowledge workers now occupy the preponderance of jobs and careers in the US information economy, yet the general education curriculum at many of our institutions of higher education do not require coursework covering these concepts. As discussed by Cuban, the curriculum change process is a difficult process, yet educational leaders have been successful at making these necessary changes. The case of the USF illustrates a current example of this change process, though the curriculum revision ignores technology literacy.

Technology literacy encompasses many difference concepts and perspectives, and thus, is a multidimensional construct. The ETS and others have attempted to operationalize the construct with observable behaviors with the meaningful use of technology. The curriculum for technology literacy can found in courses in a wide array of courses and academic units, and thus, identifying who and what should be instructed to meet a technology literacy general education requirement will require substantial changes in curriculum. These changes are necessary to close the gap imposed by a digital divide of skills and knowledge. The participants in the US information economy must rely on higher education to close the gap and elevate the individual and social benefits of higher education.

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