

and organizations. Related to technology access, the digital divide continues to widen, and teachers and administrators have no way of knowing precisely which students have outside exposure to technology tools and which students do not. The result is that teachers must choose between dedicating classroom time to teaching and reinforcing basic skills or moving on to practical applications. There are no easy answers to any of these challenges, but elementary and secondary educators must remain diligent in their commitment to creating a digitally literate society.

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*See also* Digital Literacy: Overview and Definition; Digital Literacy and Critical Thinking; Media Literacies; Message Design for Digital Media; Methods for Teaching Digital Literacy Skills; Technology and Information Literacy; Twenty-First-Century Technology Skills; Visual Literacy Skills in Science, Technology, Engineering, and Mathematics Education

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## DIGITAL LITERACY IN HIGHER EDUCATION

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The traditional notion of literacy is simply the skill of reading and writing. What this notion lacks is a sense of the complexity of skills associated with decoding and producing written texts, especially within the context of higher education and professional scholarship. One relatively limited expansion of the notion of literacy is that it should include not only textual media but also other modalities such as visual, aural, and interactive modalities (presumably many of which are digital). Richard Lanham's use of the term *digital literacy* explicitly included technology-supported multimodal text in the

concept of literacy. Later, the New London Group expanded this notion using the term *multiliteracy* to encompass a larger notion of literacy as participating in ever-widening means of communicating. In addition, the rise of the Internet has increased the need to extend the literacy of reading and writing texts to the skills associated with locating, filtering, and applying texts of various sorts in the context of a global hypertextual network, including activities such as evaluating source credibility, free text search skills, and so on.

Newer definitions of literacy encompass the context-sensitive, culturally mediated nature of literacy along with the degree to which literacy implies participation in what John Buschman terms *critical reflexivity* and Thomas Mackey and Trudi Jacobson call *metaliteracy*. Critical reflexivity encompasses the degree to which participating in a discourse allows one to take a step back and analyze it. This is a crucial step for college students who encounter complex ideas to be comprehended, investigated, and advanced. This entry discusses definitions of digital literacy in higher education, the role of libraries and universities in fostering digital literacy, and digital literacy as a form of scholarship.

### Digital Literacy in Higher Education

Digital literacies are variously defined by different scholars but can include fluency with texts in digital form, a critical stance regarding digital texts, and comprehension of the contexts that produce those texts. Some definitions focus on the need to understand the complex ideas represented in digital media. Others focus on the skills and tools needed to use technology to engage information sources. Still others emphasize technology, research, and critical thinking generally, within the context of knowledge production. Finally, some scholars argue that digital literacy in higher education should include a critical understanding of the context of information, media, and knowledge production, including not only the limitations and constraints imposed by the design of digital tools, but also the social, legal, political, economic, and cultural constraints of the media. These broad definitions of digital literacy (including metaliteracy, critical reflexivity, and multiliteracy) are applicable in many contexts from early childhood to adulthood; they are especially important in understanding digital literacy in undergraduate and graduate education and in professional scholarship.

### Training Needs at the Postsecondary Level

Higher education plays a crucial role in development of these sophisticated digital literacies, including technology skills, critical reflexivity, and professional

knowledge-generation practices. While some presume that so-called digital natives are so familiar with technology that they do not need training in digital literacy, research has demonstrated that entering college, students typically lack important skills on the use of technology for scholarship, and that high school students are ill prepared to use information for taking ownership of their own learning process as they transition to college. Universities have traditionally played a role in the development of critical thinking and critical literacies, as well as in the self-directed use of professional-grade knowledge tools. A 2012 digital literacy task force report by the American Library Association's Office for Information Technology Policy noted that digital literacy is tied to information literacy in that each requires the other.

These literacies are particularly important in the college context. Both information literacy and digital literacy are required by students and teachers in equipping lifelong learners as they leave formal education. When considering the role of digital literacy, clearly digital fluencies are tightly connected to the research- and knowledge-building process of scholarship, and thus especially to education in scholarly institutions.

### Teaching and Fostering Digital Literacy in Higher Education

Colleges and universities foster digital literacy in a number of ways. Faculty may teach digital literacy directly, either within a subject domain or as part of distinct courses. In this process of facilitating digital literacy, some try to distinguish between the traditional role of universities in fostering information literacy as contrasted with the broader concept of digital literacy. For example, the London School of Economics (LSE) defines *information literacy* as knowing how to find, evaluate, use, and manage information; and defines *digital literacy* as knowing how to find, organize, evaluate, and create information using digital technology.

However, whether taught separately or together, students clearly need both sets of skills and fluency in using those skills in a relevant and meaningful process. LSE accomplishes this through explicit college-level courses, including skills traditionally labeled information literacy (e.g., searching, managing citations, and locating primary sources) and skills ranging from collaborative writing and research tools to copyright and using social media for scholarship.

The responsibility to educate for digital literacies in colleges and universities not only falls upon faculty but also extends to librarians as the traditional custodians of information resources and information literacy. Previously, librarians focused on card catalogs, citation

formats, and bibliographic databases but are increasingly emerging as an important source of mentoring on the information-intensive aspects of scholarship (e.g., research and writing skills, data curation and analysis, critical interpretation, and support for dissemination and publication). These skills are essential especially for undergraduates who may find the information and knowledge practices of university scholars to be discordant with the practices they experienced in high school or in their personal lives. Librarians are increasingly becoming the primary teachers of digital literacy as it occurs across disciplines.

### Digital Literacy as a Form of Scholarship

Historically, scholarship has been tightly linked to print literacy. Scholars created and pored over texts, helped others interpret and learn from them, and played a critical role in their duplication and preservation. By the 20th century, these roles had been institutionalized separately through the research and teaching faculty, the libraries, and university presses. As digital technology has become more prevalent, scholars have used their literacies to do the same in digital media, and the diverse roles related to print literacy have begun to overlap and shift.

In the humanities, scholars use digital literacies in a variety of ways that transform their disciplines and how those disciplines are taught. For instance, the Modern Language Association states in its tenure guidelines that faculty should receive credit for production of nontraditional scholarly works and using digital technologies to enhance research communities and research communication. Cathy Davidson and others advocate for the role of humanist scholars in bringing digital literacy to universities and colleges.

Similarly, in the sciences and engineering, the uses of technology have transformed disciplines and changed the ways in which knowledge is discovered and transmitted. Modeling, simulations, and computationally augmented bench work are fundamentally altering how science and engineering are taught and researched in the PC (personal computer) and Internet era. Core literacies in sciences have started to include not only calculus or statistics but also the ability to program computational tools such as Matlab or to build software to conduct experiments *in silico* (sometimes termed *in vitro*) rather than *in vivo* or *in vitro*. Digital literacy not only is a way to conduct research or improve how traditional subjects are taught, but it is a core competency for humanists and engineers alike.

Librarians participate in the processes of digital literacy by training students or faculty and providing support for campuswide initiatives and by fulfilling a

consultative role in research-related aspects of digital literacy. For example, in 2012, Penn State University set up the Scholarly Workflow Project to explore not student-oriented digital literacy needs, but the needs of professional scholars in using digital tools for purposes such as research management, scholarly creation, and archiving scholarly materials, whether data or publications. Projects such as these and new job titles such as *scholarly communications librarian* or *data management librarian* help to illustrate how digital literacy is becoming both a core competency of libraries within universities, and part of their teaching and research mission as well.

## Conclusion

In summary, a variety of definitions for digital literacy all serve to broaden the concept from mere use of technological tools to participation in broad communities of discourse in a variety of media. Universities, colleges, and libraries play a critical role in these literacies. Higher education institutions are beginning to take on the duty of helping foster digital literacy through a variety of programs, including formal education, and in supporting digital tools through service and support roles such as in the libraries.

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*See also* Digital Literacy: Overview and Definition; Digital Literacy and Adult Learners; Digital Literacy and Critical Thinking; Digital Literacy in Elementary and Secondary Education; Information, Technology, and Media Literacies; Information and Communication Technologies: Competencies in the 21st-Century Workforce; Technology and Information Literacy; Twenty-First-Century Technology Skills

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## DIGITAL STORYTELLING

Digital storytelling is the use of multimedia technology to create and present a first-person narrative that is shared with others on the Internet or through some form of digital delivery. Digital stories generally present a particular point of view about a specific topic and tend to be fairly short in length, in the two- to 10-minute range. The media used can include text, graphics, photographs, video, music, recorded audio narration, and sound effects that make up a story using picture and video editing software. Other names for this type of practice include computer-based narratives, digital essays, and electronic storytelling. Digital storytelling has been adopted in schools and in higher education because it allows students to develop technology skills while encouraging their personal development. This entry discusses the development of the practice of digital storytelling, how digital storytelling is used in schools, and the skills students acquire through digital storytelling. It then details some of the specific types of technology used in digital storytelling.

As a formal practice, digital storytelling began in 1994 in San Francisco, California, when Joe Lambert, Dana Atchley, and Nina Mullen founded a community media organization that taught digital storytelling skills. The digital storytelling process they developed centered on giving voice to people and honoring them and their stories as having value. The organization later moved to Berkeley, California, where it became the Center for Digital Storytelling. Lambert identified seven elements that he states are essential for effective digital stories:

1. A point of view
2. A dramatic question
3. Emotional content
4. Economy
5. Pacing
6. The gift of your voice
7. An accompanying soundtrack

These seven elements are often cited in workshops where digital storytelling is taught.

The practice of digital storytelling has spread and grown through the years as educators, individuals, and organizations discovered it and saw its value as a way to empower people to tell and share their stories. Digital storytelling is used by teachers in schools and taught in workshops in libraries, community centers, and by nonprofit groups. Businesses may also practice