



Horizon Project

Digital Literacy in Higher Education, Part II

An NMC Horizon Project Strategic Brief

Volume 3.4, August 2017



Digital Literacy in Higher Education, Part II

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Funding for this independent research endeavor and publication was provided by Adobe.

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Citation

Alexander, B., Adams Becker, S., Cummins, M., and Hall Giesinger, C. (2017). Digital Literacy in Higher Education, Part II: An NMC Horizon Project Strategic Brief. Volume 3.4, August 2017. Austin, Texas: The New Media Consortium.

Cover photo via BigStock Photography

The NMC gratefully acknowledges Maha Bali for development of the table on page 5.

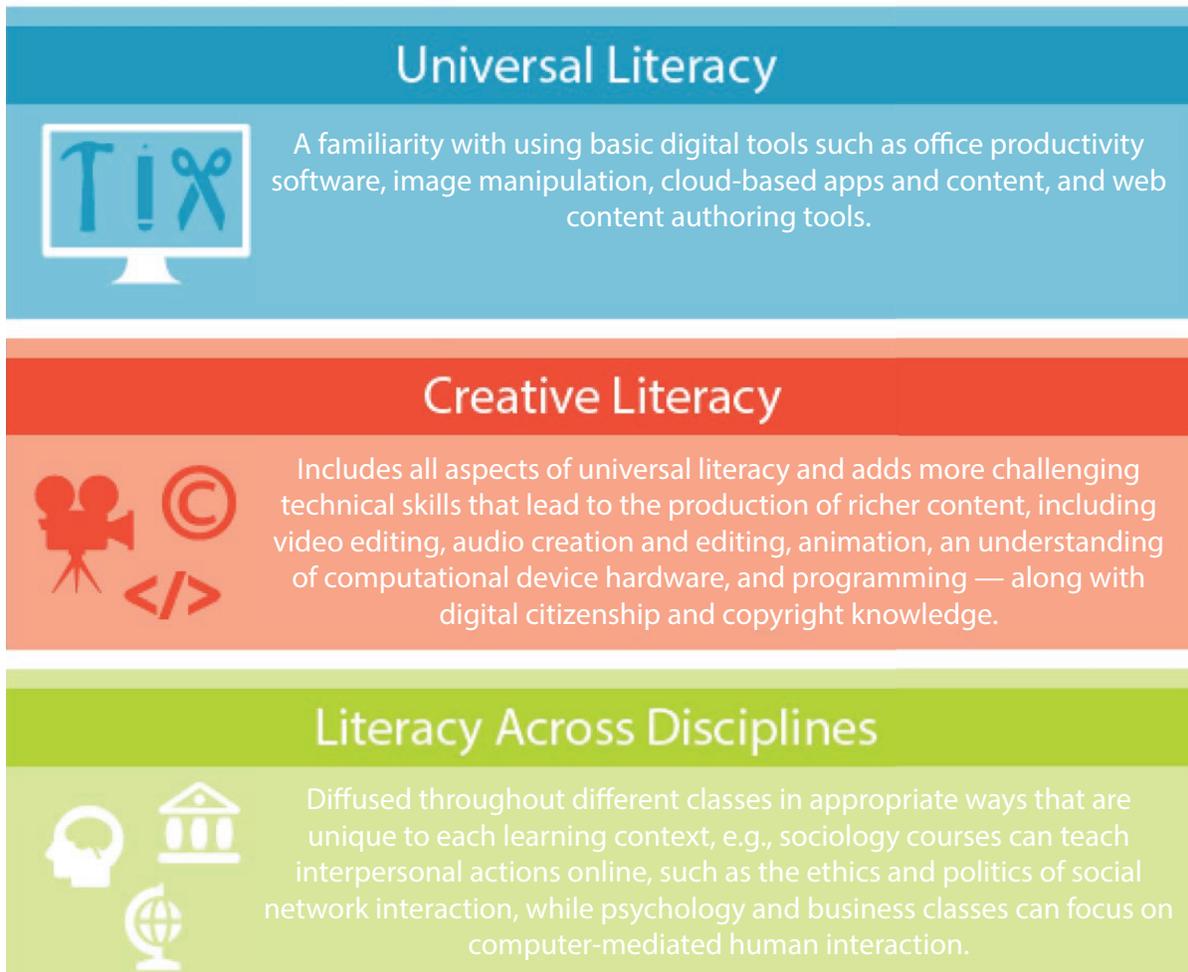
Volume 3.4, August 2017

Introduction

Digital Literacy in Higher Education, Part II: An NMC Horizon Project Strategic Brief explores the landscape of digital literacy as it relates to advancing more authentic learning in campus settings. Supported by Adobe, the aim of this independent research is to illuminate current frameworks, exemplars, and challenges that are impacting the evolution of this pressing topic. The brief is intended to contribute to the body of knowledge used by the higher education community to inform strategic planning around digital literacy initiatives.

This publication is a follow-up to the New Media Consortium's (NMC) 2016 strategic brief on digital literacy,¹ which established baseline definitions of digital literacy, citing key commentary and models along with best practices and recommendations for implementing successful digital literacy initiatives. It relied on a survey of hundreds of NMC members. The NMC's initial US-focused work underscored that digital literacy transcends the basic operations of using a technology. In this understanding, learners must be able to combine those skills with reflection, imagination, and awareness of their implications in order to perform a task or produce an object that would otherwise not be possible without the technology. The 2016 report identified three different digital literacies, each with distinct standards, potential curriculum, and implications for creative educators, as summarized in the graphic below:

Three Models of Digital Literacy



Building upon the 2016 brief, the present work delves more deeply into the subject matter, examining digital literacy through global and discipline-specific lenses to uncover new contexts and applications that are shaping the way learners discover and create content.

The prioritization of digital literacy in higher education is being substantially influenced by the workforce. For example, the World Economic Forum (WEF) predicts that by 2020, 35% of the skills considered vital for workplace success will have changed. Following the Fourth Industrial Revolution, fields such as robotics, autonomous transportation, biotechnology, and genomics call for skill sets that revolve around a blend of technical savvy, creativity, and complex thinking.² The WEF report, *The Future of Jobs*,³ specifically identifies the top ten essential skills for 2020 versus just two years ago:

2020

1. Complex Problem Solving
2. Critical Thinking
3. Creativity
4. People Management
5. Coordinating with Others
6. Emotional Intelligence
7. Judgment and Decision Making
8. Service Orientation
9. Negotiation
10. Cognitive Flexibility

2015

1. Complex Problem Solving
2. Coordinating with Others
3. People Management
4. Critical Thinking
5. Negotiation
6. Quality Control
7. Service Orientation
8. Judgment and Decision Making
9. Active Listening
10. Creativity

The Future of Jobs consistently references creativity as a key asset, advancing it as a skill from the tenth place slot in 2015 to third for 2020. In an era where automation is bolstering efficiency and machines are taking over traditionally laborious and tedious activities,⁴ they still cannot replicate or replace human imagination. Put another way, embedded in effective digital literacy training is the spirit of learners as creators. Digital tools themselves are merely enablers, pushing the envelope of what learners can create. No longer is it acceptable for students to be passive consumers of content; they can contribute to the local and global knowledge ecosystem, learning through the act of producing and discussing rich media, applications, and objects. In the words of many institutional mission statements, students do not have to wait until they graduate to change the world.

Using readily available digital content creation tools (e.g., video production and editing, web and graphic tools), students are evolving into digital storytellers, weaving subject matter from their courses into narrative tapestries that illustrate a deeper understanding of what they are learning. Also inherent in this form of creative expression is applied emotional intelligence, through which learners connect ideas and themes to their own lives and elucidate bigger picture societal trends.

Integrate the element of collaborating with peers to produce stories and products, and digital literacy now encompasses the important skills of being able to coordinate with others to create something truly original that neither mind would fathom independently.

"If you create a project like ...an app or a platform ...with students as a target audience and as creators, with steering and guidance by faculty, you would get a co-creation mesh that requires students to contemplate the use of digital tools in their academic undertaking."

-Johan Bergström, International Business Coordinator @ ITS Umeå University, Sweden

While emphasis on the word "digital" highlights the growing role of technology in teaching and learning, close to the heart of digital literacy is adaptability. It is not sufficient for college students to simply know how to use the range of mobile devices, software, and media-creation tools that exist at a given time throughout higher education. They must also be able to intuitively acclimate to new digital environments, developing habits that cultivate lifelong learning and the continuous mastery of new

skills, given the rapid pace of technological development and its uses in practice. Further, students must apply critical judgment to their selection of digital tools, evaluating their contributions to digital space in the context of their own geographic contexts and the potential reach of their work.^{5,6}

The development of digital literacies can also be uneven. While institutions might aim for digital literacies education to encompass the 2020 skills identified by the World Economic Forum, or to address similar sets of desired competencies, implementation efforts remain unequal throughout the world and within communities. *Digital Literacy in Higher Education, Part II* explores a breadth of perspectives as reflected in the state of digital programs across Europe, the Middle East, and Africa (the EMEA countries)⁷. In particular, the notion of students as creators is unevenly expressed worldwide. The political and economic climate of nations often dictates progress and applications of digital literacy. In Middle Eastern countries, for example, the current curricular emphasis mostly appears to be on media literacy, which can be interpreted as a response to dominant government influence over local media. That is, some institutions may teach skepticism towards their own nation's media, or towards the media products from other nations. At smaller levels of analysis, digital literacy implementations vary between institutions, academic departments, and individual faculty. Ultimately, that immediate academic context exerts a powerful shaping force on the real-world practice of digital literacies.

The ability to discern credible from inaccurate resources is foundational to digital literacy. Without the ability to judge the reliability of content, how can learners be expected to create reliable content? Even in the US, with the surge of fake news surrounding the recent presidential election, media literacy (though by no means a new topic) has become a hot button issue, heavily championed by (among others) academic libraries where digital literacy is often a core tenet of major initiatives.

To make sense of digital literacy progress, this publication highlights an array of frameworks: work done by organizations and individuals to standardize and make more accessible the elements and intended outcomes of digital literacy. Research produced by Jisc, UNESCO, Open University, and others demonstrate the diverse interpretations and constantly evolving nature of the topic. While the first NMC strategic brief generated simplified definitions with the goal of making such a complex topic more approachable, *Digital Literacy in Higher Education, Part II* expands the conversation by summarizing and connecting the wide variety of viewpoints that comprise this area. A lack of broad consensus on the meaning of digital literacy still hinders its uptake, although a growing body of research is helping higher education professionals better navigate the continuous adjustments to the field brought about by emerging pedagogies and technologies.

After exploring the general landscape of frameworks, this brief brings into focus specific in-practice applications. Exemplary digital literacy programs and curriculum at college and universities around the world showcase innovative work that institutions can build upon and emulate. Finally, the publication concludes with perspectives of eleven digital literacy thought leaders from a range of backgrounds. Hailing from higher education institutions across the US, Egypt, Australia, South Africa, and Sweden, they have each authored a brief essay that captures how digital literacy is impacting the settings where they work and live. These essays serve as both reflections and calls to action to advance the understanding of digital literacy worldwide, generate new meaning, and spur better programs in the perpetually shifting learning landscape.

The Digital Literacy Landscape

Current digital literacy frameworks share several characteristics across institutions and nations. Importantly, no framework focuses on a single skill or approach. All institutions view digital literacy as plural, encompassing multiple elements or requirements, and usually combining technical, psychological, and interpersonal dimensions. Indeed, many sources, such as Jisc,⁸ UNESCO,⁹ and Beetham and Sharpe¹⁰ publish their plural literacies visually as matrixes, dials, or multi-pronged diagrams, emphasizing their multi-element natures. Additionally, none focus solely on technical skills, but instead add social, psychological, or cultural competencies. The infographics on the following pages showcase the frameworks referenced here, for further detail.

Information literacy is a nearly universal component within these digital literacy frameworks. Critically finding, assessing, and using digital content within the vast and sometimes chaotic internet appears as a vital skill in almost every account, including those published beyond libraries. In contrast, media literacy is less widely included in digital literacy publications, possibly due to a focus on scholarly, rather than popular, materials. Digital literacies ultimately combine information and media literacy.

These frameworks also tend to view the user or learner as someone becoming empowered through digital literacy study and practice. Learning communication, thinking, and technical skills helps students develop their individual voices, study more effectively, participate more fully in civic life, and enhance their career prospects. Creative expression appears in many of these accounts, celebrated for engaging users' abilities to produce new content.

Content creation also seems to have a psychological benefit, as some frameworks refer to users as not just skilled, but confident or capable. One is phrased in the second person to emphasize the reader's empowerment ("You will be able to..."), while several publications (MediaSmarts,¹¹ UNESCO) note online dangers, including cyberbullying and access to bad information, casting digital literacy as a way for users to learn to triumph over those challenges. At least one report sees teaching children to be content creators as a positive step in their personal development.¹²

Empowerment features a combination of positive mental attitudes, including critical thinking and curiosity. Frameworks uniformly urge learners to approach the digital work thoughtfully, intentionally, and actively — not passively. Curiosity is a core value in this philosophy; that is to say, learners are to seek out information rather than wait for it to come to them. Problem-solving is often allied to these attitudes.

Another side of empowerment through digital literacies is interpersonal engagement. While each framework offers different emphases, they tend to encourage people to learn how to communicate and collaborate with others by using digital tools. This involves applying human abilities to the digital world, such as successfully conducting teamwork or expressing empathy for others.

It is important to remember that learning technical skills on their own can empower some learners. Each digital literacy framework took care to identify specific technologies or technology categories. As Courtney Miller observes in her editorial contribution below, "To be competitive, it is important to know and understand how to use digital tools, no matter your major or intended occupation." Student panelists at the 2017 NMC Summer Conference noted that many first-generation or low-income college students begin their studies without an understanding of how to use programs such as Microsoft Word and PowerPoint or collaborative tools like Google Docs in a higher education setting.¹³ Educators should not lose sight of that side of digital literacy when addressing other, non-technological topics.

Contemporary frameworks do differ from each other in important ways, especially in how they situate social skills and understandings. Some frameworks, for example, encourage openness to variation based on local contingencies, such as cultural differences, while others (Beetham and Sharpe, British Columbia¹⁴) strive for universality.

Several emphasize the importance of civic engagement through digital platforms, citing digital citizenship (British Columbia, UNESCO), while others are silent on this score, focusing instead on technical and personal aspects. Some, like UNESCO's, encourage people to respect freedom of inquiry and expression. Still others view digital literacy empowering users politically, to become organizers or leaders (MediaSmarts). Others want users to view technology not in isolation but in social and political contexts, along the lines of critical theory (Belshaw¹⁵). Several offer guidelines for institutions, in addition to individual learners (Educational Testing Service,¹⁶ Massachusetts Department of Elementary and Secondary Education¹⁷).

Copyright and privacy law awareness also appears in some accounts (British Columbia, MediaSmarts). Furthermore, several frameworks (Mozilla,¹⁸ UNESCO, ACRL¹⁹) clearly value production, recognizing students as makers, which usually entails instruction in copyright law awareness and, in the case of the United States, knowledge of fair use. In contrast, others downplay or simply do not mention this. Perhaps the latter stems from an inherited 20th century media model which casts audiences as passive or uncritical consumers, rather than as reflective co-creators or makers in their own right. Popular anxiety over social media may also contribute to non-producer frameworks because so many of those platforms enable rapid content creation and distribution. On the other hand, some digital literacy efforts include social media as a tool for knowledge and production.²⁰

While most frameworks argue that learning digital literacy is a lifelong practice, given the ferocious pace of technological developments, others describe digital literacy as a static set of skills and abilities. The former aligns with the idea of lifelong learning, while the latter fits into an assessment mechanism.

The table below illuminates the inclusion or exclusion of important dimensions of digital literacies across the frameworks detailed in the infographics on the pages that follow. The brighter colors indicate that the element is mentioned explicitly (i.e., included within the framework's key words), while the paler shades signify an indirect reference within the framework, and white means no reference. The table is intended to provide at-a-glance information on the prominence of these dimensions across multiple frameworks.

	<i>Communi- cation</i>	<i>Critical Thinking</i>	<i>Tech Skills</i>	<i>Content Creation</i>	<i>Civics and Citizenship</i>	<i>Copyright Law</i>
Beetham and Sharpe	Dark Blue	Dark Pink	Light Green	Light Orange	Light Blue	White
Belshaw	Dark Blue	Dark Pink	Light Green	Dark Orange	Dark Blue	Light Pink
British Columbia	Dark Blue	Dark Pink	Light Green	Dark Orange	Dark Blue	Dark Pink
Educational Testing Service	Dark Blue	Light Pink	Light Green	Dark Orange	Light Blue	White
Jisc	Dark Blue	Light Pink	Light Green	Dark Orange	Light Blue	Light Pink
Massachusetts Dept. of Elem. and Secondary Ed.	Dark Blue	Dark Pink	Light Green	Dark Orange	Light Blue	Dark Pink
MediaSmarts	Light Blue	Dark Pink	Light Green	Dark Orange	Dark Blue	White
Mozilla Foundation	Dark Blue	Light Pink	Light Green	Dark Orange	Dark Blue	Dark Pink
Open University	Dark Blue	Dark Pink	Light Green	Light Orange	White	Light Pink
UNESCO	Dark Blue	Light Pink	White	Dark Orange	Dark Blue	White
Association of College and Research Libraries	Light Blue	Dark Pink	Light Green	Dark Orange	Dark Blue	Dark Pink

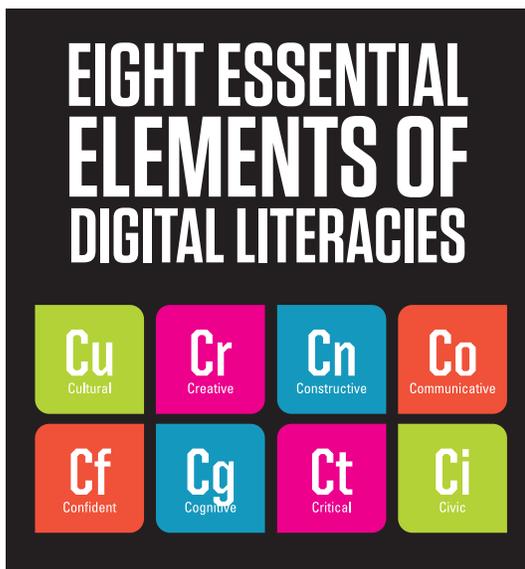


1 DIGITAL LITERACY FRAMEWORK

Beetham and Sharpe
go.nmc.org/jiscdesign

This is a matrix model, with categories in ascending order of cognition.

These categories incorporate ICT capabilities, information/media capabilities, and learning/thinking capabilities. Each matrix node is a first-person statement, such as “I can” and “I do.” Overall, the framework thoughtfully blends technical and interpersonal skills.



This work is a derivative of Doug Belshaw's "Essential Elements of Digital Literacies" (<http://digitalliteracy.es/wiki/Diagrams>) under CC 4.0 Attribution license.

THE ESSENTIAL ELEMENTS OF DIGITAL LITERACIES



Belshaw
go.nmc.org/belshaw

In a seminal digital literacy analysis, Doug Belshaw organized the characteristics and principles of digital literacy that were known at the time, and pushed them further. His framework integrates ongoing development and transformation. An eight-limbed approach is broken down into C-words, or components of digital capacity. The first four are skillsets, while the last four are mindsets.

3 DIGITAL LITERACY FRAMEWORK

British Columbia
go.nmc.org/bcdlf

“Digital Literacy is the interest, attitude and ability of individuals to use digital technology and communication tools appropriately to access, manage, integrate, analyze and evaluate information, construct new knowledge, and create and communicate with others.”

This framework draws out technology competence with a large emphasis on personal and social connections.

KEY ASPECTS INCLUDE:

- Research and Information Literacy
- Critical Thinking, Problem Solving, and Decision Making
- Creativity and Innovation
- Digital Citizenship
- Communication and Collaboration
- Technology Operations and Concepts

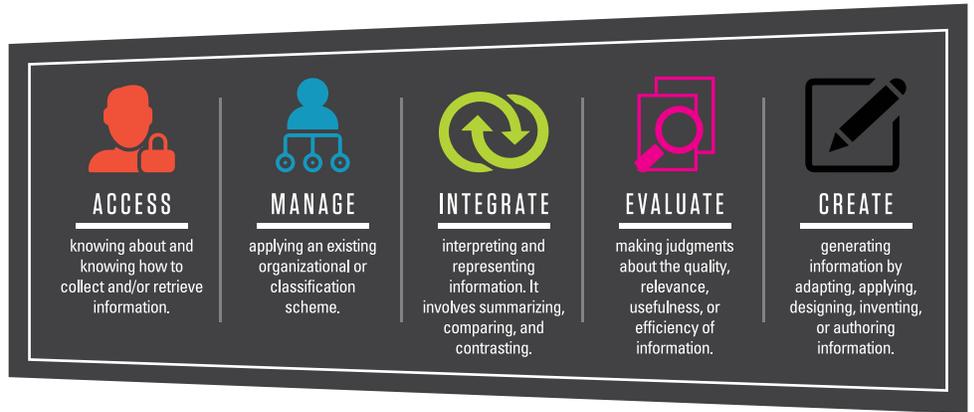


4 DIGITAL TRANSFORMATION: A FRAMEWORK FOR ICT LITERACY

Educational Testing Service
go.nmc.org/etsdt

A model emphasizing how society grapples with rapidly developing and transformative information technology, "ICT literacy is using digital technology, communications tools, and/or networks to access, manage, integrate, evaluate, and create information in order to function in a knowledge society."

There is a heavy focus on both the social and technological aspects, with digital literacy represented as situational and variable.



DEVELOPING DIGITAL LITERACIES

Jisc

go.nmc.org/jiscdev

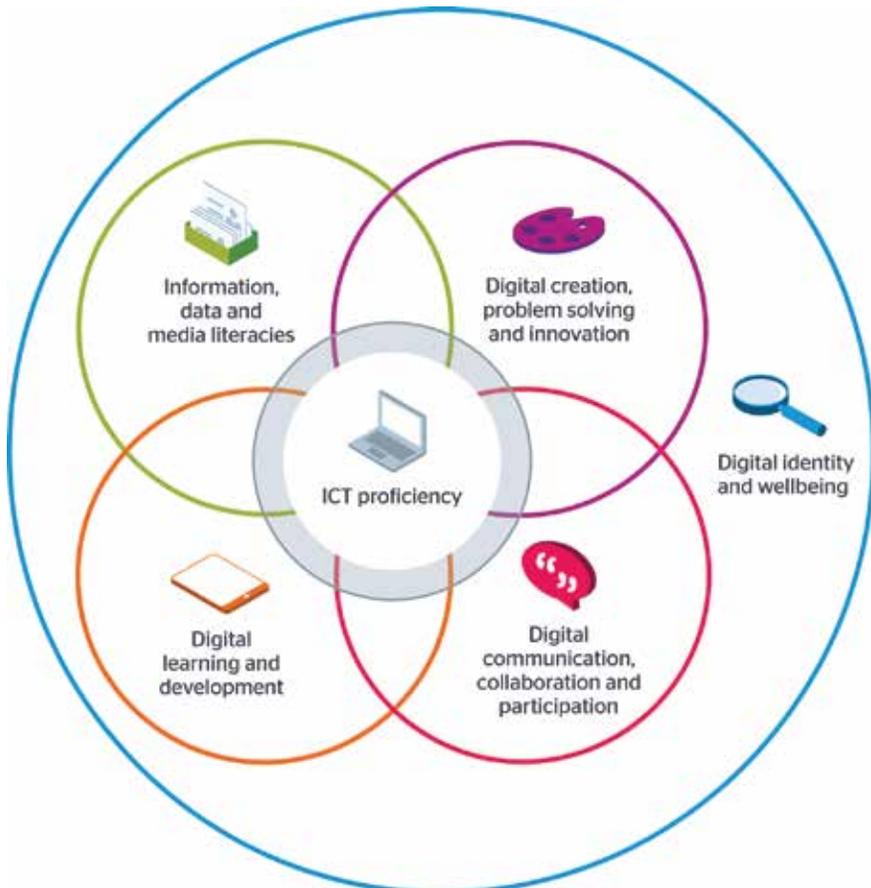


Image by Jisc, used with permission

A combination of media, information, and digital literacies, this framework draws upon the work of Beetham and Sharpe. While emphasizing individual ownership of learning, the guide also describes institutional strategies.

Jisc states, "Digital literacies are those capabilities which fit an individual for living, learning and working in a digital society ... Digital literacy looks beyond functional IT skills to describe a richer set of digital behaviours, practices and identities. What it means to be digitally literate changes over time and across contexts, so digital literacies are essentially a set of academic and professional situated practices supported by diverse and changing technologies."

This definition can be used as a starting point to explore what key digital literacies are in a particular context, such as an institution, service, department, subject area or professional environment.



DIGITAL LITERACY FRAMEWORKS

6 2016 MASSACHUSETTS DIGITAL LITERACY AND COMPUTER SCIENCE (DLCS) CURRICULUM FRAMEWORK

Massachusetts Department of Elementary and Secondary Education

go.nmc.org/massdlcs

This framework is aimed at K-12 education, but is also relevant to higher education. In spite of the title, it focuses more on digital literacy than computer science, offering four “strands” of topics and standards:



There is also perspective on digital literacy implementation as it offers concepts to guide teaching and learner support:

<p>Learning</p> <p>Digital literacy and computer science ideas should be explored in ways that stimulate curiosity, create enjoyment, and develop depth of understanding.</p>	<p>Teaching</p> <p>An effective program is based on a carefully designed set of content standards that are clear and specific, focused, and articulated over time as a coherent sequence.</p>	<p>Equity</p> <p>All students should have a high quality digital literacy and computer science program that prepares them for college and a career.</p>
<p>Literacy Across the Content Areas</p> <p>An effective digital literacy and computer science program builds upon and develops students' literacy skills and knowledge.</p>	<p>Assessment</p> <p>Assessment of student learning in digital literacy and computer science should take many forms to inform instruction and learning.</p>	<p>Planning and Support</p> <p>An effective digital literacy and computer science program requires coherent district-wide planning and ongoing support for implementation.</p>

USE, UNDERSTAND & CREATE: A DIGITAL LITERACY FRAMEWORK FOR CANADIAN SCHOOLS

7

MediaSmarts

go.nmc.org/msoverview
go.nmc.org/msframework (PDF)

Aimed at K-12, this framework is also generally applicable to higher education as it emphasizes the triad of using, understanding, and creating digital content, broken down into seven key aspects of digital literacy:

- Ethics and Empathy
- Privacy and Security
- Community Engagement
- Digital Health
- Consumer Awareness
- Finding and Verifying
- Making and Remixing

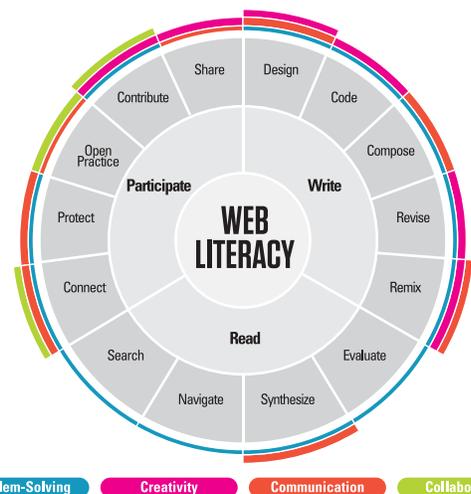
8 MOZILLA WEB LITERACY

Mozilla Foundation

go.nmc.org/mozweb

These literacies are intended for the open web. The open web is crucial to Mozilla’s philosophy and practice. They are broken down into four 21st century skills: problem-solving, communication, creativity, and collaboration.

Mozilla states that web literacies entail “knowing how to read, write, and participate in the digital world... [c]ombined with 21st century leadership skills.”



21st Century Skills

The Mozilla Web Literacy Map has been shared under a CC 4.0 Intl license by the Mozilla Foundation. This version has been adapted from the original at <https://learning.mozilla.org/en-US/web-literacy>.



9 DIGITAL AND INFORMATION LITERACY FRAMEWORK

Open University

go.nmc.org/oudigitit

This framework uses a matrix model, based on developmental levels versus digital literacy categories. The latter includes skills and mastery of the ability to:



Understand and engage in digital practices



Find information



Critically evaluate information, online interactions, and online tools



Manage and communicate information



Collaborate and share digital content

Open University states, “Digital literacy includes the ability to find and use information but goes beyond this to encompass communication, collaboration and teamwork, social awareness in the digital environment, understanding of e-safety, and creation of new information. Both digital and information literacy are underpinned by critical thinking and evaluation.”

FIVE LAWS OF MEDIA AND INFORMATION LITERACY (MIL)

UNESCO

go.nmc.org/unescofive

10

A media-information-digital literacy sequence is explicit here, with an emphasis on freedom of expression and the notion of people as producers. UNESCO divides digital literacy into five laws, or recommendations for how members of the human race should be able to use information:

LAW ONE

Information, communication, libraries, media, technology, the Internet as well as other forms of information providers are for use in critical civic engagement and sustainable development. They are equal in stature and none is more relevant than the other or should be ever treated as such.

LAW TWO

Every citizen is a creator of information/knowledge and has a message. They must be empowered to access new information/knowledge and to express themselves. MIL is for all — women and men equally — and a nexus of human rights.

LAW THREE

Information, knowledge, and messages are not always value neutral, or always independent of biases. Any conceptualization, use, and application of MIL should make this truth transparent and understandable to all citizens.

LAW FOUR

Every citizen wants to know and understand new information, knowledge, and messages as well as to communicate, even if she/he is not aware, admits, or expresses that he/she does. Her/his rights must however never be compromised.

LAW FIVE

Media and information literacy is not acquired at once. It is a lived and dynamic experience and process. It is complete when it includes knowledge, skills and attitudes, when it covers access, evaluation/assessment, use, production, and communication of information, media, and technology content.



11 FRAMEWORK FOR INFORMATION LITERACY FOR HIGHER EDUCATION

Association of College and Research Libraries (ACRL)

go.nmc.org/acrlframe

This update to the information literacy paradigm relies on a metaliteracy of multiple ways to engage the overall information environment, including reflecting on one's learning and research processes. That environment includes individuals and organizations, personal dynamics and social forces, and both discovering and productively responding to information.

The ACRL defines information literacy as “the set of integrated abilities encompassing the reflective discovery of information, the understanding of how information is produced and valued, and the use of information in creating new knowledge and participating ethically in communities of learning.”

This framework includes six component concepts, each of which shapes learner dispositions and practices:

AUTHORITY IS CONSTRUCTED AND CONTEXTUAL

INFORMATION CREATION AS A PROCESS

INFORMATION HAS VALUE

RESEARCH AS INQUIRY

SCHOLARSHIP AS CONVERSATION

SEARCHING AS STRATEGIC EXPLORATION

Digital Literacy in the US vs EMEA Countries

Digital literacy as a concept crosses many international borders. Much as media, information, and digital technologies exist globally, the need to develop ways of critically apprehending them occurs in all nations. Naturally, differences occur between national definitions and frameworks for digital literacy; teasing out those variations sheds further light on the topic's complexity.

For example, perhaps this report's most important point — the idea that digital literacy is about learners as creative producers — is unevenly expressed around the world. The user as “prosumer,” in Alvin Toffler's phrasing, is certainly rising as a theme, yet digital literacy protocols sometimes miss or downplay it.

The United States has been very active in exploring and teaching digital literacies, as befits the nation of Silicon Valley and a large higher education and cultural heritage ecosystem. At the same time, European, Middle Eastern, and African nations (EMEA) have developed a robust set of digital literacies frameworks and policies, including competency listings and a re-engagement with media literacy.

Generally speaking, United States digital literacy frameworks tend to focus on educational policy details and personal empowerment, the latter encouraging learners to become more effective students, better creators, smarter information consumers, and more influential members of their community. For example, [the Bryn Mawr digital competencies framework](#) is “intended to help individual Bryn Mawr students... identify the digital skills and critical perspectives they will need to be 21st century leaders.”²¹ In contrast, international structures dwell on human rights language and media literacy. The latter may arise from a different media ecosystem, one that features more central or state-controlled media outlets while also grappling with the impact of new media. The use of human rights language in certain digital literacies frameworks seems to draw on the established norms of international organizations, especially the humanitarian non-governmental organization (NGO) sector.

Further differences appear when focusing on individual regions or continents. European projects, for example, often refer to digital competencies, a term not used as widely elsewhere.^{22, 23} Media literacy remains vital there, receiving modern boosts in discussions about representing refugees and the new populism.^{24, 25, 26} National policies are vitally important in European digital literacy work, unsurprising for a continent well populated with nation-states and struggling to redefine itself, while still trying to grow economies in the wake of the 2008 financial crisis and subsequent financial pressures.²⁷ Some frameworks and projects include content creation as a key digital literacy component, as with this recommendation for Balkan digital strategy: “Media and information education (with an emphasis on critical thinking and switching from consumption to action) should start at early ages, but address all ages.”²⁸

In contrast, African digital literacy is more business-oriented. Frameworks often speak to job skills and digital entrepreneurship. New skills and professions are emphasized, symbolized by the call for “new collar” positions.²⁹ The major resource gap between much of Africa and the developed world clearly shapes this construction of digital literacy, highlighting a technological skills gap driven by uneven development and exploitation, while suggesting a digital path forward to economic development. Creativity and content production receive less emphasis here than in other nations, and may reflect the relative lack of African-sourced content available online.

Middle Eastern nations offer yet another variation, with a strong focus on media literacy. As with other regions, this can be a response to countries with strong state influence or control over local media. It can also represent a drive to produce more locally-sourced content, as opposed to consuming

material from abroad, which may elicit criticism of neocolonialism or religious challenges.³⁰ Moreover, media literacy also simply came late to the region, as “no Arab university offered media literacy [in 2005]. Even the term was alien to most media educators.”³¹

This centrality of media literacy puts a different spin on digital literacy as a production-oriented practice than it has in other regions, as it emphasizes responses to professionally produced media more than individually created content. To some extent, it retains an older model of user as consumer, albeit a critical or skeptical one. Put another way, a key aspect of media literacy in the Middle East lies in helping young people apply a critical lens to messaging around political and religious issues.^{32, 33} However, current programs are fostering participation in content creation through digital production training in addition to development of students’ evaluation skills.³⁴

Digital literacy is a complex phenomenon in 2017, when considered internationally. Nations and regions are creating ways to help their populations grapple with the digital revolution that are shaped by their local situations. In doing so, they cut across the genealogy of digital literacies, touching on its historical components: information literacy, digital skills, and media literacy. Taken together, globally, there is a large-scale, big picture move towards transforming learners and users into digital creators.

Expanding on Current Definitions

The NMC's 2016 strategic brief on digital literacy included a discussion of definitions. The report concluded with its own working definition encompassing three levels of institutional implementation, ranging from a universal literacy (combining information literacy, critical engagement, and student as producer) to a creative literacy (placing a stronger emphasis on digital creation, including more advanced skills such as audio/video editing, 3D printing, and animation) to a discipline-specific sense (in which learners focus on skills best suited to their course of study).³⁵

Based on this year's research, that model holds up fairly well. The sequence of media to information to digital literacy continues to function across the current findings, with the first two embedded firmly within the third. The emphasis on learners as creators remains vital and future-oriented, if still unevenly adopted in the present. The skills explored in the prior report — office productivity tools; media capture, creation, and editing (images, audio, video); web skills (writing and searching); physical media skills (computer hardware, 3D printing); and emerging fields (VR, AR, MR) — remain in play.

Context matters a great deal, as different institutions and nations offer varying digital literacy instances. For example, a library-led initiative tends to have different contours than one driven in part by educational technology. A departmental effort will have a narrower scope than a campus-wide one. Moreover, recent media and political developments have drawn more attention to information literacy's role within the digital field.

Indeed, the largest difference between the 2016 and 2017 research can be found in an increasing emphasis on the role of culture and politics. In 2016 a US-centric approach was taken, with special attention to digital citizenship. This report expands on that exploration, broadening the number of nations and regions represented, and diving into greater detail.

This includes a greater focus on the role of power and inequality in digital literacy. The findings reveal a need for a stronger emphasis on thinking through digital literacy in terms of unequal access to information technology, based on inequalities of economics, gender, race, and political divides. Current definitions must take digital citizenship more seriously, recognizing that such a sense of political engagement necessarily involves not only the aforementioned inequalities, but also connections to activism around the world and across the political spectrum. For example, when the ISTE Student Standards invoke a form of literacy that touches on "copyright laws, online ethics, digital identity, privacy, and security,"³⁶ it is now known that citizenship goes beyond that construction. The ACRL Framework offers a related view when it urges users to consider that "information possesses several dimensions of value, including as a commodity, as a means of education, as a means to influence, and as a means of negotiating and understanding the world. Legal and socioeconomic interests influence information production and dissemination."³⁷

This section will explore how digital literacy manifests in certain disciplines. This is partly to identify differences by intellectual and professional fields, but also to generate a sense of digital literacy's full diversity across the curriculum. Four exemplary areas have been selected, limited for reasons of space: humanities, business, computer science, and general education/introductory courses.

HUMANITIES

What does it mean to be digitally literate in history, literature, or philosophy? Creativity in these disciplines often involves textuality, given the large role writing plays in them, as, for example, in the [Folger Shakespeare Library's instructor's guide](#). In the digital realm, this can **include** web-based writing through social media, along with the creation of multimedia projects through posters, presentations, and video. **Information literacy** remains a key part of digital literacy in the humanities.

The digital humanities movement has not seen much connection with digital literacy, unfortunately, but their alignment seems likely, given the turn toward using digital technologies to explore humanities questions. That development could then foster a spread of other technologies and approaches to the rest of the humanities, including mapping, data visualization, text mining, web-based digital archives, and “distant reading” (working with very large bodies of texts). The digital humanities’ emphasis on making projects may also increase.

BUSINESS

Digital literacy in this world is focused on manipulation of data, from spreadsheets to more advanced modeling software, leading up to degrees in management information systems. Management classes unsurprisingly focus on how to organize people working on and with digital tools. A [course](#) at Columbia Business School aims to “equip ‘non-technical’ executives with the terminology, tools, and context required to effect change in a software and internet-driven world.” At least one company has published [digital literacy training videos](#) for business employees and leaders. Business also offers a different perspective on open content, both because intellectual property appears as an important curricular object and since the business model of openness is quite teachable. On a different level, institutions could partner with businesses to seek ideas for what business majors will need to know in the management space — those skills are **likely** to be a combination of technical prowess with personal and interpersonal awareness. Business intelligence, for example, can neatly connect those domains.

COMPUTER SCIENCE

Naturally, [coding](#) appears as a central [competency](#) within this discipline. Other aspects of the digital world feature prominently, including hardware and network architecture. Some [courses](#) housed within the computer science discipline offer a deeper examination of the impact of computing on society and politics, along with how to use digital tools. Media production plays a minor role here, beyond publications (posters, videos), as many institutions assign multimedia to other departments.

Looking forward to a future when automation has become both more widespread and powerful, developing artificial intelligence projects will potentially play a role in computer science literacy.

GENERAL EDUCATION & INTRODUCTORY COURSES

What forms does digital literacy take in these required and/or early-stage classes? Here, information literacy looms large, especially in countries concerned about media issues (the United States, Britain, Middle Eastern nations). Technical skills are important, but restricted to a baseline accessible to all students, so it is expected that curriculum will place a short-term focus on writing and perhaps editing images. General education courses [may be the best suited for](#) teaching at least introductory digital literacy; indeed, Ashford University offers an entire undergraduate course on [Digital Literacy for Life & the Workplace](#).

Introductory classes are likely to acquaint learners with discipline-specific tools and practices, but not to the full degree expected of majors. There has been a great deal of discussion about requiring some coding experience of all students as a general education requirement. Few institutions have implemented such a plan, but this may grow over time as the demand for both coding and computational thinking increases.

Exemplars

Institutions worldwide are implementing initiatives across disciplines to bolster digital literacy capabilities for students and help faculty integrate 21st century skills into curricula. Higher education leaders should take note of the following examples of programs and learning opportunities designed to facilitate content creation, increase technology fluency, and promote critical thinking:

All Aboard

go.nmc.org/allaboard

A number of Irish universities are collaborating in the All Aboard project, comparing digital literacy and professional development frameworks, exemplars, and models in order to develop Creative Commons resources that encourage faculty and students to build their literacy and confidence in technology use.

Big Fish School of Digital Filmmaking

go.nmc.org/bigfi

Big Fish School of Digital Filmmaking in South Africa aims to create socially-conscious digital content producers and storytellers by arming students with digital skills and technical training to create meaningful, engaging narratives with potential to inspire positive action and innovation.

Colgate's Digital Learning and Media Center

go.nmc.org/dlmc

Colgate University's Digital Learning and Media Center (New York) is a flexible multi-use learning space housed in the Case Geyer Library. It is staffed with student media mentors to provide student and faculty support and workshops on utilizing new tools or implementing them into courses.

Data Information Literacy

go.nmc.org/datainf

The Institute of Museum and Library Services is funding research teams from Purdue University, the University of Minnesota, the University of Oregon, and Cornell University to work with university faculty in developing and implementing a data information literacy curriculum that addresses knowledge and skills gaps arising from the continued evolution of technology driven research.

The Digital Fluencies Project

go.nmc.org/digflu

The Digital Fluencies project initiated by Penn Libraries at the University of Pennsylvania consists of workshops open to faculty and students across all disciplines and schools. They focus on understanding, producing, and legally distributing digital media.

Digital Literacy Expertise by Stealth

go.nmc.org/tee

An academic subject liaison librarian at Teesside University in England has arranged focus groups with cross-disciplinary faculty and students to identify elements of digital literacy they considered most meaningful along with preferred training mechanisms. This will help the library integrate targeted digital tools and face-to-face trainings into university curriculum.

Digital Polarization Initiative

go.nmc.org/dpi

The Digital Polarization Initiative is a cross-institutional effort overseen by Washington State University Vancouver that consists of a collaborative wiki where students can engage in fact-checking and share additional context for news stories they come across in their daily lives.

Domain of One's Own

go.nmc.org/umw

The Domain of One's Own (DoOO) initiative at the University of Mary Washington provides a series of adaptable modules related to digital identity and fluency while giving students, faculty, and staff the opportunity to register their own domain name and hosted web space to work in free of charge.

Emory Center for Digital Scholarship

go.nmc.org/emor

The Emory Center for Digital Scholarship (ECDS) provides student training in topics including digital storytelling and publishing, Creative Commons, and managing online and professional identity. Their Digital Scholarship Internship Program allows students to work shifts at the center helping faculty, staff, and fellow peers with digital research and pedagogy.

Health Promotion Focus at Athabasca

go.nmc.org/heal

Athabasca University (Canada) is overhauling their graduate curriculum, beginning with the Master of Health Studies and Master of Nursing programs, to incorporate digital literacy themes. These include collaboration and networking through social media and student-generated digital content and curation.

IBM Africa Skills Academy

go.nmc.org/ibmafr

The IBM Middle East & Africa (MEA) University Program coordinates with universities in the Africa region to provide students with IT skills to live and work in today's increasingly digital environment.

Literacies in Second Languages Project

go.nmc.org/lslp

The Literacies in Second Languages Project housed at the School of Education and Pedagogy at Universidad Pontificia Bolivariana (Colombia) is supporting research into how digital literacies have emerged as a social phenomenon in physical and virtual communities and the role of 21st century literacies in educational contexts.

Media and Digital Literacy Academy of Beirut

go.nmc.org/mdlab

The Media and Digital Literacy Academy of Beirut is a short bootcamp-style summer training that provides media and digital literacy mentoring to academics and students in the Arab region along with training in digital content creation. This includes photo manipulation, audio and video editing, data visualization, and social network analysis.

Open Badges for Soft Digital Skills

go.nmc.org/badgesof

Carl von Ossietzky University in Oldenburg, Germany hosted a workshop for the eLENE4work project to better understand how leveraging DIGCOMP Open Badges can recognize digital

soft skills, so that students can better understand how specific actions, tools, and open educational resources help them assess their own level of competencies to meet expectations of employers.

Perspectives at Deakin

go.nmc.org/persp

As part of its digital literacy initiative, the Deakin University Library (Australia) has custom-built an online role-play platform that helps users learn to critically evaluate information, view complex problems from a variety of interdisciplinary perspectives, read widely and critically, and negotiate solutions.

Project Udaan

go.nmc.org/udaa

Project Udaan, initiated by students in the Shaheed Sukhdev College of Business Studies, provides computer access and digital training services to rural areas of India with a particular focus on reaching women.

PROMPT

go.nmc.org/prompt

In Sweden, the Professional Master's Education in Software Development project is a cooperative effort between academia and industry to provide a national education alternative that focuses on software development skills including courses on advanced software architecture, web application security, and machine learning with big data.

The Socio-Economic Evaluation of a European Project: The DIYLab Case

go.nmc.org/diylab

Several European universities have collaborated in a project called DIYLab, aiming to inject do-it-yourself (DIY) culture into primary and university curriculum; the program encourages students to become producers of open educational digital objects and provides scalability guidelines to foster the development of key digital competences.

Step-Up Student Technology Enrichment Program

go.nmc.org/stepup

University of South Carolina Upstate implemented a five-year, cross-disciplinary Student Technology Enrichment Program in which faculty redesigned their courses to be more technology-intensive and provide students with experience in digitally analyzing and communicating information.

Summer Institute in Digital Literacy

go.nmc.org/suminst

University of Rhode Island's School of Education and Professional Studies has partnered with their Media Education Lab to offer a six-day intensive blended postgraduate program in digital literacy to help K-12 teachers, college faculty, librarians, and youth media professionals design learning experiences around project-based inquiry leveraging digital tools.

UB Curriculum Foundations

go.nmc.org/buffa

University at Buffalo (New York) has revised its undergraduate general education curriculum to integrate iLab, a flipped course approach in which a team of librarians deliver content on digital, information, and media literacy through Blackboard and Digication. The curriculum is

rooted in both ISTE standards and the ACRL Framework for Information Literacy in Higher Education.

The University of Edinburgh's 23 Things for Digital Knowledge

go.nmc.org/23thi

Modeled after the University of Oxford's open digital literacy curriculum, 23 Things Oxford, the University of Edinburgh has developed its own course, guiding participants through 23 digital concepts and practices that involve sharing out blog posts upon completing each section; each student's blog is submitted at the end to receive an Open Badge.

Using the ACRL Framework for Information Literacy to Foster Teaching and Learning Partnerships

go.nmc.org/cape

Librarians and faculty at the University of the Western Cape (South Africa) collaborated through a series of workshops to develop an online tutorial aimed at helping instructors develop curricula that allows students to better understand their responsibilities as both consumers and producers of information.

Eleven well-regarded higher education digital literacy leaders from around the world have contributed thought pieces on topics such as digital citizenship, information and media literacy, and the pedagogical approaches behind properly teaching digital literacy.



How Does Digital Literacy Change Pedagogy?

By Judith Bailey and Dr. David Santandreu Calonge, The University of Adelaide

“Let’s face it, in the age of Google and Wikipedia... we just can’t sell facts for a living anymore. They are available with a click of a mouse” (Firenstein, 2013, TED lecture).³⁸

In the 21st century, students want to be engaged in and outside of the classroom with technology. Technology is ubiquitous and students interact and connect 24/7 with other people through the use of social networks and text messaging. Liking and giving an opinion on Facebook, Instagram, or TripAdvisor is part of their daily routines and increasingly they expect to use relevant digital tools when they study at university.

Students are not all digital natives, and do not necessarily have the same level of capabilities. Some need to be taught to use online tools (such as how to navigate a LMS) for learning. However, once digital literacy skills for staff and students are explicitly recognized as important for learning and teaching, critical drivers for pedagogical change are in place.

Pedagogy

Prior to the advent of ubiquitous technology, there was a different dynamic. There was no easy access to information, and information had to be memorized. The academic, during lectures, was often considered the only source of knowledge, and print resources were the mobile devices of today. Now, students can easily spend their entire day on computers, and have unlimited access to a continuous flow of information, which they need to critically analyze. Pedagogy should therefore be informed by this societal shift and needs to respond accordingly.

Power dynamics between students and teachers have gradually changed over the past decades. Students should be at the center of university decision making, including curriculum design and pedagogy.

Students need digitally confident academics. A degree is very often a synonym of employment and success but also of a huge and long-term debt for many families. Students need to have confidence that their courses and programs use authentic content and assessment which will (1) give them crucial transferrable skills and (2) prepare them for employment and future life choices.

Safe but innovative environments should be created in universities where academics experiment with technology-enhanced learning tools and discuss the pedagogy underpinning their uses, to facilitate student engagement. This will help them empower students to integrate technology into their learning, where and when needed. Academic staff need to create teaching materials which students can revisit in their own time and at their own pace. This could include reusable/sharable OERs, lecture-capture technology, flipped classroom pedagogical approaches, and/or MOOCs to respond to students’ needs. However, academics need to be aware of cognitive digital overload for their students

and tailor learning to ensure that there is a mix of online and face-to-face activities. Ideally students should be partners in the process, as they are often a source of energy, new ideas, and approaches.

Pedagogy that uses an inquiry based/problem solving approach is a great framework to enhance the use and practice of digital skills/capabilities in the classroom. Digital tools are inherently well designed to be used in seminars and tutorials to help with formative assessment, or as diagnostic tools before students begin to assess their current knowledge.



Inequalities within Digital Literacies

By Maha Bali, American University in Cairo and Virtually Connecting

There are three (intersecting) ways in which inequalities, whether of class, race, gender, or other dimensions, shape digital literacy. The first is in *access* to digital tools and the functional skills to use them; the second is in how the external environment can support or hinder an individual or group's capability to *enact* or practice the digital literacies learned (these factors might be cultural, social, economic, or political); and the third is the *extent* to which particular literacies are urgent or important for certain populations.

If we make a parallel to the [human capability approach](#),³⁹ Martha Nussbaum's work speaks about "[combined capability](#)": she separates capability as learned/nurtured in an educational environment (for example), from how the sociopolitical environment may encourage or prevent someone from actually applying the capability.⁴⁰ Within the human capability approach, in certain contexts and for certain people, particular capabilities take precedence, priority, or urgency over others. [Helen Beetham](#) suggests that where basic digital access is difficult, individuals will not be able to prioritize developing their digital identity or pursuing their life goals through digital means: Simon Rae illustrates this in an adaptation of Maslow's hierarchy of needs [here](#).⁴¹

Digital Redlining

[Chris Gilliard and Hugh Culik's work on digital redlining](#) shows how inequality of access to infrastructure is often grounded in intentional decisions that affect certain populations, based on race and class, reproducing social inequality.⁴² As Gilliard and Culik write, "[digital justice isn't only about who has access](#)⁴³ but also about [what kind of access they have, how it's regulated, and how good it is](#)."⁴⁴ On one level, those who live in digitally redlined spaces (homes, educational institutions) already have less access to learn digital literacies simply because they do not have the technical access to do so.

For example, certain online resources are not available to them, and their bandwidth may be lower, reducing their ability to engage in synchronous video conversations. This means that even if they figure out a way to learn the digital tool or literacy, they may not be able to apply it, because the environment restricts their capacity to do so (combined capability). On the other hand, because of the situation they find themselves in, it becomes more imperative for them to gain awareness of the ways in which digital surveillance works, and the ways in which it threatens them. They may also benefit from learning ways to circumvent challenges like institutional firewalls, and how to find open access versions of articles they need that are not available via their institution or public library.

Authoritarian Regime, Surveillance, and Algorithms

An authoritarian regime may prevent access to communication technologies in general, preventing people from acquiring the literacies to use them altogether; but such a regime may also allow access to such technologies, but engage in covert (or [even overt](#)) surveillance based on how people use

these tools.⁴⁵ Thus, bloggers may risk arrest and torture if they critique the regime in their writing. Even if they, as individuals, have developed the digital literacy to use their blogs to express their activism/citizenship, the sociopolitical environment makes it difficult for them to actually apply this expertise without substantial personal risk. And again, it becomes imperative for such persons to be aware of the ways in which they can be surveilled that are not announced, and the ways in which algorithms may connect their Google searches, clicks, likes, etc., and profile them without any explicit writing of political views on their blog (see Cathy O’Neill’s book [Weapons of Math Destruction](#)⁴⁶ or read danah boyd’s piece [Towards Accountability](#)⁴⁷ for more on how algorithms tend to discriminate).

Gender

Consider women living in cultures where there is a lot of gender disparity. In some instances, girls are simply discouraged from using computers, but in other cases, girls are actively prevented from using computers at home as often as boys. In some cultures, it is acceptable for boys to go to internet cafes, but not girls — so access to this opportunity to develop digital literacies is unequal, which hinders girls’ ability to develop any digital skills and literacies altogether ([Jo Sanders’ research](#) also shows there are attitudinal factors that limit girls’ capacity to develop digital skills and literacies, not just issues of technical access⁴⁸). Beyond individual learning, however, lies the real threat of online harassment or abuse, which women and minorities risk more than dominant members of society. Anticipating such risks may prevent women from using social media, or from conversing with strangers online. Moreover, it becomes more imperative for them to learn about cyberbullying, cyberstalking, and ways of protecting oneself from online harassment. Awareness of privacy also becomes essential here, as online threats can turn to physical threats.

There are also ways in which digital literacies can be taught to have an equity focus, for example, incorporating ways of making one’s work more accessible to people with disabilities, or using alternatives that work for people with varying levels of internet connectivity.

The role of higher education, and educators, is to work on nurturing digital literacies across the curriculum, taking into account the inequalities of access to opportunities to develop digital literacies before and outside of higher education, and keeping in mind the intersectionality of incoming students and how their priorities within digital literacies will differ.



Academic Librarians: Campus Partners for Digital Literacy

By Steven Bell, Temple University Libraries

Over [500 librarian respondents to a survey](#) about first-year college students’ research skills agree on one thing — and it is no surprise. Most of the students they encounter are routinely unprepared for college-level research.⁴⁹ Whether that means overreliance on Wikipedia and Google, inability to evaluate content, or a dysfunctional lack of awareness about (or unwillingness to learn) library research tools, our students put themselves at a digital disadvantage in a post-truth world.

Most academic librarians, no doubt, offer some form of information literacy instruction to new students. This disconnect speaks to the demand for academic library literacy initiatives for college students, but also its inability to effectively address the problem. In practice, literacy education often fails because too little time is allotted for it in the college curriculum, non-library faculty and administrators deprioritize it, and students’ overconfidence about their digital literacy skills upon entering college leads them to underestimate its value to their academic success.

Multiple wake-up calls are sounding loudly. [Evaluating Information: The Cornerstone of Civic Online Reasoning](#), a report from the Stanford History Education Group, concluded that K-20 students are shockingly inept and ill-prepared when it comes to evaluating information they encounter from the internet and social media sources. In a series of problem-based tasks, most students were unable to differentiate basic elements of websites, such as advertisements. They failed to properly rationalize or explain their decisions concerning information quality, accuracy, or credibility.⁵⁰

Shortly after the Stanford report was released in November 2016, escalating evidence of deceptive fake news spiraled into a global call for educators to integrate digital and news literacy into the curriculum. In reaction to the emergence of [post-truth society](#),⁵¹ Alison Head of [Project Information Literacy](#)⁵² and John Wihbey, Assistant Professor of Journalism and New Media at Northeastern University, capture the decline and fall of digital literacy when they write:

*Many of us, not only students, have become a nation of Google searchers looking for instantaneous matches of facts and figures rather than thoroughly interrogating the veracity of the information we find online, and reflecting on how it informs our thoughts, beliefs, and opinions.*⁵³

The confluence of these observations speaks to the need for digital literacy at all levels of education. Current efforts are failing to equip students with the skills to achieve what the Stanford report termed “civic online reasoning,” described as “the ability to judge the credibility of information that floods our computing and communication devices.”

In its 2016 strategic brief on digital literacy, the NMC stated that “librarians play a role in teaching and supporting digital literacy efforts, drawing on their information literacy background, but libraries are deemed less likely to be important literacy sites, suggesting new, even entrepreneurial roles for the traditional academic library professional.”⁵⁴

The current gap between students’ information literacy skills and their need to internalize digital literacy competencies creates an opportunity for academic librarians to support students in the pursuit of civic online reasoning at the core of NMC’s multimodal model of three digital literacies. Academic librarians need a new strategy that evolves information literacy to an expanded role educating digitally literate students. Let’s build a new model in which academic librarians are [entrepreneurial collaborators with faculty](#),⁵⁵ supporting their [classroom efforts to help students](#) become responsible sharers and commentators of news on social media.⁵⁶

According to the [Ithaka S+R Library Survey 2016](#), library deans and directors are committed to student success and are ready to allocate resources to teaching and research support.⁵⁷ Let’s put those resources to work designing a framework that enables librarians to expand their information literacy initiatives to support broader digital literacy skills. Academic librarians have a tradition of recognizing unfilled needs, such as support for digital scholarship, open access, and OER, and then adopting a campus leadership role in advocating for change. Leveraging the student research project, academic librarians can emerge as the new campus leaders for digital literacy.



Student-Faculty Co-Creation

By Johan Bergström, Umeå University

“Digital literacy is not just about ensuring that students can use the latest technologies, but also developing skills to select the right tools for a particular context to deepen their learning outcomes and engage in creative problem-solving” (*NMC Horizon Report > 2017 Higher Education Edition*).⁵⁸ I see

universities as being strategically positioned to be leaders in helping students develop digital literacy skills. That said, I do not really see universities and university faculty investing in widespread tactics to address the digital literacy needs of the student population. They simply do not seem well-equipped to guide youth in developing the digital competencies they need.

While the discussion of “digital natives” versus “digital immigrants” may be somewhat outdated, the idea that there is a digital divide between faculty and learners still affects the mindset of educators in the higher education sector. According to the 2015 EDUCAUSE Center for Analysis and Research (ECAR) student and faculty studies, there is a gap between how students expect to use technology and how they actually experience technology in their learning environments. Students and faculty acknowledge the gap, but neither group seems particularly well-versed in how to use technology as consistent engaging and meaningful tools to enhance learning and develop enduring digital literacy competencies.⁵⁹

My perspective is influenced by my position as a university employee and as a parent. I have three sons aged 17, 13, and 10. They have all grown up using a variety of digital tools. They are hyper-connected. They use these tools to communicate, play, create, learn, and consume media. They are all naturally digitally savvy and the tools are integrated into their lives. The fact that tech is ubiquitous and natural also means that there is no innate reflection on how the tools could be used — and more importantly, why they are using them! By every aspect of the definition they would be considered digital natives, but I think they have traits of “digital naïves” as well. My definition of digital naïves is just that: using the digital tools of today, without reflecting on what they are or how they can be used.

According to the latest Beloit College Mindset list, the class of 2020 has always had books read to them on audible.com; students have never had to watch or listen to programs at a scheduled time, or purchase airline tickets anywhere but online.⁶⁰ This will obviously affect one’s worldview — experiences are customized/personalized, they are available on demand, and they are interactive. But how is this progress being replicated or translated in ways that will necessarily or automatically help learners better understand in what ways digital tools and practices can be enforced in their everyday studies?

This brings me to my point. There is a disconnect between how students experience and interact with technology in their personal lives and how they use technology in their roles as students. Yes, students are digitally savvy, and yes, universities have a role in questioning (insightfully of course) their sometimes brash digital savviness. We have a situation where students are expecting more, but (as I see it) cannot provide a clear demand, while faculty are unable to walk in the shoes of the students.

So, what to do?

Let the two join forces!

I think there is room to create a structured and purposefully curated innovation process to overcome this challenge. Perhaps it sounds contradictory, but let me explain. Every program or class at an academic institution requires at some point or another some kind of project work. If these projects were to be joined into a larger body of work, which is driven with sustainability in mind, I see a possibility to create collaboration between students and faculty from different disciplines, all driven by the needs of an overarching project.

If a project like this had a goal to produce something beneficial to students, thus a student-to-student concept, this would even further support the idea. I envision a project like this to have a longevity over a couple of years, with each piece of the puzzle adding to a greater whole.

Two examples of services designed to help students to better understand and steer their own study experiences are Pattern from Purdue University (studypattern.org)⁶¹ and the Dutch Quantified Student (quantifiedstudent.nl) program.⁶² In the former, students use the solution to input information about when studying is being conducted, how it went, and even where it is being done. This data can be compared to actual study results. In the latter, an analytics-driven platform helps students understand their own study environment and success. By incorporating different metrics and user input, insights targeted to the individual learner can be drawn.

So, if you create a project like that — an app, platform, or whatever, with students as a target audience, and students as creators, but with steering and guidance by faculty — you would get a co-creation mesh that requires students to contemplate the use of digital tools in their academic undertaking.



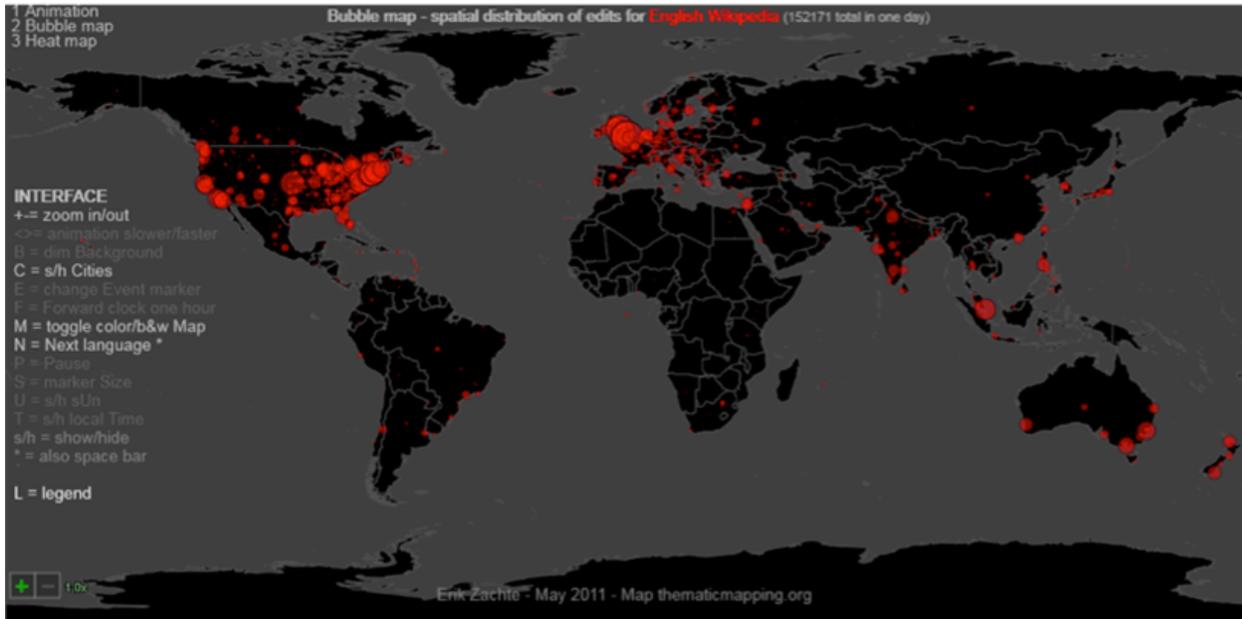
How Does Education Change if We Take Students Seriously as Producers?

Cheryl Brown, University of Cape Town

That digital literacies are now globally accepted to be essential for higher education students in the 21st century is uncontested (Goodfellow and Lea 2013);⁶³ what remains deeply contested is the form those literacies take, how they play out in different contexts, which components are privileged and which invisible, under which conditions certain aspects flourish, and why other aspects do not flourish in certain circumstances (Brown, Czerniewicz, and Noakes 2015).⁶⁴

With new forms of social media and access to mobile technology increasing, new digital practices are afforded (Ito et al., 2010).⁶⁵ Online content creation (OCC) “has been viewed as an opportunity to promote a democratic and diverse public sphere in which elite voices no longer dominate” (Schradie, 2011).⁶⁶ However, Schradie (2011)⁶⁷ and Brake’s (2014)⁶⁸ studies from the global North point out that people who engage in OCC are a minority of internet users; in effect, this participation gap challenges existing notions of the internet as an egalitarian public space. This is a worldwide reality, as the annual undergraduate study conducted by the EDUCAUSE Center for Analysis and Research (ECAR) across 15 different countries shows just how dominant consumption — rather than production — practices are among university students (Dahlstorm and Brooks, 2014).⁶⁹

In their article on geographies of information inequality, Graham and Foster (2014) noted that the small amount of participation in the internet from Sub-Saharan Africa has meant that much of the content created in this region comes from other global informational cores.⁷⁰ It is therefore critical that students, particularly from underrepresented parts of the world, become empowered to be creators and producers of online content. A visualization of one day’s edits to English Wikipedia further emphasizes the global disparity of online content creation:



Source: [Wikimedia](#)⁷¹

However, the potential of emerging technologies for creative production or participatory practices has long been acknowledged (Allen et al. 2012, Joubert and Wishart 2012).^{72, 73} Allen et al. (2012) observe that creativity is not generally supported in the current university environment despite its real potential to enhance learning. Even within the university learning context, OCC is largely learner- and not teacher-driven (Mills 2010).⁷⁴ Yet such practices offer very real possibilities for authentic learning.

In her review of authentic digital literacy practices, Mills (2010) notes that “innovative and productive forms of learning can occur with digital media in peer- and interest-driven networks that are oriented toward social communication and recreation.”⁷⁵ It is this very orientation towards the recreational and the social which renders the Connected Learning lens so useful. As Mills notes, Connected Learning (CL) enables us to describe a particular set of digital practices spanning the formal and the informal, both curricular and extracurricular activities as well as activities that intersect across the academic and personal lives of students. These practices have been previously observed as integral in students’ lives across a range of contexts.

In an environment where content is everywhere and increasingly available, students’ digital literacy in terms of the ability to access information is almost ubiquitous. Many students are able to survive in this digital world. However, in order to thrive, students need to move from consumers to prosumers, i.e., producers of content. They need to be able to find relevant and open resources in order to be able to adapt content; they need to create resources, participate in discussion, and collaborate across borders and time zones.

Through participation and contribution, students can take responsibility for their own learning and their need to develop digital literacy skills and practices.

In a study of higher education students, Brown, Czerniewicz, and Noakes (2015) show that CL is an approach relevant beyond school-aged youth and suggest that the intentional design of CL

experiences in the curriculum would not only assist students to expand their networks and their opportunities for feedback beyond their immediate contexts, but that through the development of OCC literacies, students would be aided in the development of digital identities aligned with their courses and their career ambitions. They also note that practices which marked students as digital creators, rather than simply digital consumers, gave graduates an edge in an increasingly complex and competitive world.⁷⁶



Reading the Web Requires Specific, Web-Native Strategies. We Should Teach Them.

By Michael Caulfield, Washington State University Vancouver

A recent experiment conducted by Sam Wineburg and Sarah McGrew tested the ability of different individuals to evaluate information on the web. Included in the experiment were professional fact-checkers, history faculty, and Stanford students. In one task, for example, readers were asked to evaluate the source of an article on the minimum wage.⁷⁷ For this activity, a reasonably small set of web literacies gets a reader to the answer quickly -- the site on which the article is published is the production of a public relations front group for the restaurant industry.

The fact-checkers, used to verifying information online, did well. Every individual in the fact-checkers group found the answer in less than 200 seconds, using simple, web-native techniques.

The other groups? Not so much. Sixty percent of the students -- Stanford students, no less -- were unable to find their way to the information. The faculty did not do much better, with 40% of them failing to trace the information to its source. These were history scholars, who were trained over decades to look closely and critically at texts, and yet many could not navigate a simple problem of web credibility.

Much has been made of our post-truth, fake news moment. But the concerns from a web literacy standpoint are much broader than fake news or even misinformation. The majority of reading now occurs on the web, yet people read in this format without having mastered basic web skills or navigation of online information.

Our approach in the past has often been to treat these questions of truth on the web as a general category of critical thinking about texts; if students could only think more critically about things such as authorship, we tell ourselves, they would be able to spot the lies, evaluate claim, and discern reputation. But, if anything, the past year has shown us how otherwise intelligent people can be hopelessly naïve -- the historians of our example, for instance, had strong critical thinking skills and top-notch information literacy skills. But not only did those skills not help them in their tasks, it is quite possible they resulted in negative transfer -- the use of techniques appropriate to print, but inappropriate in a web context. What they lacked was not insight or reasoning: they lacked a deeper understanding of how the web was structured and the specific techniques one can use to track web truth to ground.

How has this happened? In my experience, teaching students to sort truth from fiction on the web has often been seen as a version of something else. It is seen as an extension of critical thinking, for example, or a subset of information literacy. It is lumped in between using library indexes and evaluating journal articles. But it increasingly looks like reading on the web is distinct enough from other information environments that it should be taught more explicitly, to better tease out the unique properties of the experience and the skills required to master it. Such a program of instruction would involve less "thinking about web documents" and provide more concrete strategies and tactics

for tracing claims to sources and for analyzing the nature and reliability of those sources. It would be based not off of older information literacy advice, but on the observed practice of the professionals (such as fact-checkers and Wikipedians) who excel in this new environment. And it would provide practical web-centered advice: how to read the edit history of a Wikipedia page, trace the source of a viral photo, or identify the publisher of a website. How to tell if a Twitter user is verified, or how to spot sponsored content on a web page.

Would it work? Would specific web strategies help our students to better identify questionable health advice, fake stories, and corporate astroturf? To trace claims to sources and validate expertise? We do not know. But identifying what works for the accomplished web reader and teaching students those skills directly seems as good a place as any to start, and the massive failure of current approaches to produce web fluent readers shows there may be little left to lose by trying something new.



Self-Directed Digital Literacy Learning: Eliciting Learner Commitment

By Lisa Janicke Hinchliffe, University of Illinois at Urbana-Champaign

So many of the pieces one reads about digital literacy (or any of its companion literacies — information, media, computer, technology, etc.) present the learner as illiterate — in need of developing knowledge, skills, and abilities that the learner does not have and will not gain unless they receive explicit instruction. In contrast, there is also the literature that puts forth the concept of the “digital native” who is born into intuitive knowing, doing, etc., by virtue of the technological milieu into which they were, quite literally, born and who are thus in need of no instruction.

This latter notion is rather thoroughly critiqued by others so I will not make it my focus here. As to the former, of course it is no doubt the case that there are knowledge, skills, and abilities that learners do not have and that they could benefit from instruction (though I would still caution against the *sine qua non* perspective about formal instruction). But what of another possibility — one that I have observed repeatedly throughout my career — that of the learner who has the knowledge, skills, and abilities but does not use them? What of aliteracy?

I intend the term “aliteracy” without any moral overtones here of whether the digitally aliterate individual is a good person. (There is quite a bit of moralizing in the literature on literacy, generally about the character of a person who chooses not to read, and so I want to explicitly distance myself from that). Instead, I see this as descriptive fact. We all have skills, knowledge, and abilities that we do not use for any number of reasons — time, reward, interest, priorities, etc. — and even some that we prefer to never need to use because they are only relevant for times of crisis or danger.

Nonetheless, to the degree that digital literacy is useful and valuable to a learner’s goals, the learner not exercising that digital literacy should be of concern to the educator and potentially deserving of intervention. How to intervene to motivate use of knowledge and skills in such a way that also motivates use in non-intervention circumstances is a difficult instructional design task.

Instructors typically design for acquisition of knowledge and skills, primarily relying on the cognitive domain of learning. They develop learning activities across the levels of Bloom’s taxonomy — know, apply, evaluate, etc. — and assess student skills and knowledge by asking learners to perform different tasks that demonstrate that they can do something. But, for the aliterate learner, ability exists. They will pass every assessment of ability. But, assessed on performance outside of the assigned activities, there will not be evidence of activation of ability in other circumstances.

This is a very vexing problem. Some help is available, however, from one of Bloom's "other" taxonomies: the affective taxonomy, which is not about knowledge and skills, but about values, motivations, prioritization, and commitment. Developing learning outcomes that reflect commitment to digital literacy raises instructor attention to transfer of learning to other environments and, shared with learners, makes learners aware of the intention that they use their knowledge and skills in new contexts.

Likewise, in *Understanding by Design*, Wiggins and McTigue present the concept of teaching for transfer and identify "coaching" as the teaching mode required, stating that:

In a coaching role, teachers establish clear performance goals, supervise on-going opportunities to perform (independent practice) in increasingly complex situations, provide models and give ongoing feedback (as personalized as possible). They also provide "just in time teaching" (direct instruction) when needed. Strategies include:

- ongoing assessment
- providing feedback in the context of authentic application
- conferencing
- prompting self-assessment and reflection.⁷⁸

Reading this list, one is immediately struck by the time-intensive, individualized, and personalized nature of the instructor-learner relationship reflected in these instructional practices; however, it reveals as well that teaching for prioritization and motivation means learners constructing their own understanding of the value of digital literacy.



The Differences Academic Disciplines Make

By Joan K. Lippincott, Coalition for Networked Information

While there are many fundamental digital literacy skills that are important for all undergraduate students to develop, in my view there should be more effort devoted in the curriculum to advancing digital literacy skills related to specific disciplines than is normally the case in contemporary US higher education. Even if a student does not continue in a career in his or her major field after graduation, understanding concepts related to both operationalizing research questions and considering forms of output for research are important goals for undergraduate education. In focusing on a major field of study, especially in the last two years of a program, ideally students are learning to become practitioners in a field. It is difficult to achieve this goal if students merely attend lectures, read textbooks, and take tests as the inputs and outputs of their academic work. Whether in completing new types of course assignments or developing an innovative capstone project, students can have the opportunity to delve deeply into a discipline and develop a new set of digital literacies.

Learning specific technology tools (hardware and software) may be incorporated into developing digital literacies, but more broadly the focus should be on the types of tools that assist particular kinds of investigations relevant to a discipline. For example, using methodologies that involve geographic information systems (GIS) or text mining software assist historians in asking new types of questions. Data visualization technologies may assist those who work in biology or public health to communicate their results in a more compelling way than solely in text. Documenting performance in the arts in video or analyzing a large number of audio files (music or written word) may provide new insights into the content. While the specific tools may change over the years as technologies develop and as companies are created and become defunct, the underlying utility of a particular type of technology may remain relatively unchanged.

In the context of the information literacy component of digital literacy, the Association of College and Research Libraries' [Framework for Information Literacy for Higher Education](#) states:

Students have a greater role and responsibility in creating new knowledge, in understanding the contours and the changing dynamics of the world of information, and in using information, data, and scholarship ethically. Teaching faculty have a greater responsibility in designing curricula and assignments that foster enhanced engagement with the core ideas about information and scholarship within their disciplines. Librarians have a greater responsibility in identifying core ideas within their own knowledge domain that can extend learning for students, in creating a new cohesive curriculum for information literacy, and in collaborating more extensively with faculty.⁷⁹

All of this work is done within the context of an academic curriculum, and developing specific capabilities and understandings within the disciplinary context is an important aspect of becoming proficient with information in today's society.

Another important document, the [Degree Qualifications Profile](#) (DQP), also "implicitly asks faculty to provide field-specific learning outcomes and expectations in their areas of specialized knowledge." One of their qualifications states that a student who attains a bachelor's degree "constructs sustained, coherent arguments, narratives or explications of issues, problems or technical issues and processes, in writing **and at least one other medium**, to general and specific audiences" (emphasis my own).⁸⁰ This illustrates the changing views of the outcomes of higher education; we expect students not only to write clearly, but to be able to construct an academic argument in some other medium, for example video, performance, etc. This language reinforces my own view that the way an argument is presented needs to reflect practice in a disciplinary field and is an essential of a student's college education.



Digital Literacy in Action

By Courtney Miller, University of Southern California

As the Director of Digital Learning Initiatives at the USC Annenberg School for Communication and Journalism, I have spent the past few years designing and implementing programs to support our schoolwide digital literacy initiative. My first priority was to speak with faculty to find a common consensus on what we all agree are the tenants of a 21st century education. We also had an interdisciplinary committee conduct research. These have been the key takeaways:

1. **EVOLVING MEDIA LANDSCAPE:** We know that the media landscape is constantly evolving, so it is especially crucial to be nimble and flexible so that you can roll with the trend changes.
2. **EMERGENCE OF PARTICIPATORY CULTURE:** We now live in the Twitter-verse, where everything happens in real time, and people's lives are lived online. This shift has redefined how we interact with media and technology. As such, we need to understand how to curate our digital identities.
3. **KNOWLEDGE OF DIGITAL TOOLS:** To be competitive, it is important to know and understand how to use digital tools, no matter your major or intended occupation.
4. **ANALYZING AND INTERPRETING DIGITAL MEDIA:** Not only should you know how to navigate the digital sphere, you also need to know how to decipher it.
5. **EXPERIMENTATION AND ENTREPRENEURSHIP:** Things are changing rapidly, so it is especially important to experiment, play, and not be afraid to fail.

At USC Annenberg, we have had the luxury of designing and launching a new building (Wallis Annenberg Hall) to support this segue into the digital landscape. We have also been working on

programs and courses that make our digital offerings ubiquitous and palatable for all students, regardless of major.

We wanted to dedicate an area in our new building to serve as the hub of our digital literacy initiative. My idea and overall approach to establishing this center, which [came to be known as the Annenberg Digital Lounge](#), was to curate a space that fosters creativity, collaboration, and peer-to-peer learning.⁸¹ In this version of a makerspace, the focus is sheer digital – the 3D printers and soldering irons live in our innovation lab, which is more akin to the traditional model of a hackerspace. There are whiteboards, monitors with Apple TVs for pushing content, and movable furniture throughout the Digital Lounge. We also feature an old iMac-turned-jukebox and a revolving display of vinyl wall art.

To encourage peer-to-peer learning, we modeled our helpdesk after an Apple Genius Bar, and employ students to work as media specialists, offering expert advice on the software we provide to everyone at our school. We consistently poach some of the top talent around USC, and there is now an army of savvy students who help to manage the digital makerspace, from running the helpdesk, to creating tutorials that live on our [custom-built WordPress site](#), and managing our social media and PR.⁸²

In building a new creative team to support this makerspace, I decided to take what I like to call the ‘Swiss Army Knife’ approach, and hire a wide range of skillsets, from motion graphics and video to animation and coding. This way, the team is able to design projects in-house, including our website, and is also better equipped to handle future trend changes. I have also found, through trial and error, that it is imperative to ask for student input. How do they want to use the space? What do they want to see on our website? And how can we best market our offerings to the student audience?

To support digital literacy in this makerspace, we offer workshops on everything from creating a logo in Adobe Illustrator to launching a portfolio on WordPress. In addition to supporting the curriculum, we also want to teach our students tangible skills that will help them stand out in the marketplace. Some of our in-house workshops focus on using digital tools to land a job and cover everything from resume building, to mingling with industry guest speakers, and editing a LinkedIn headshot taken in our pop-up studio. We also believe it is crucial to help students curate their own digital identity, so this is a topic we often highlight.

As we opened the doors to our new building in 2014, we also implemented a ‘Bring Your Own Device’ policy, which better serves our students and allows our IT department the flexibility to better distribute their time and resources. As luck would have it, Adobe moved to the cloud just as we were tearing down our traditional computer labs, and given their platform-agnostic approach, we were able to [partner with them](#) and roll out the Adobe Creative Cloud to all of our students, faculty, and staff.⁸³ In addition to integrating more multimedia projects into the curriculum, I also established an Adobe Certification Center, which offers courses and exams (at no cost) to our students in Adobe Photoshop, Illustrator, Premiere Pro, and InDesign. Over 150 students take these courses each semester, and we have had a hard time keeping up with demand. Given that this is an extracurricular activity, we see this as a true mark of our digital literacy success, as students are now dedicating 20 hours of their free time towards earning a digital badge that they can add to their websites.

While there is still much more work to do in implementing digital literacy across the board, we have made some headway in a new core-required course that puts the Adobe software in the hands of freshmen. Thanks to two of my esteemed faculty colleagues, students are now looking at media and news through both a journalism and communication lens, and are applying those critical thinking skills to the multimedia projects they are simultaneously designing, using the Adobe tools. We believe these types of hybrid courses are the future of digital literacy, and we plan to keep expanding on these curricular efforts.

Lastly, I personally believe it is imperative to also teach and encourage balance alongside digital creation. Some of my colleagues have been assigning a 'blackout' project, where students have to write about their experience of shutting down their devices for a day. I also launched a 'Digital Detox' series in the Annenberg Digital Lounge, which offers mindfulness courses and hands-on arts and crafts. Taking a nod from Google and other large tech companies who employ happiness officers and provide meditation rooms, I am not alone in seeing this crucial element. As we venture even deeper into this new age of technological convergence, we must also continue to remind ourselves that the human body is still, indeed, analog.



Scholarly Communication and Digital Literacy

By Joyce L. Ogburn, Appalachian State University

In an interconnected world — replete with creative ideas, products, methods, and solutions — an understanding of the communication of research findings, the identification and preservation of evidence, and the knowledge of the rights of all parties and stakeholders in scholarly research become a necessity. Successfully navigating the creative and scholarly environments requires knowledge of applicable practices, norms, standards, technologies, and laws. One must be conversant with how digital technologies converge or conflict with ethics, economics, and politics to enhance or prohibit access to information and the creation of new knowledge. Although these issues may appear to be solely the concern of faculty, each of them can have profound influence on student learning.

Traditionally, research results are expected to be published as journal articles or books. Research requires access to many types of content that need to be curated, open to human and machine processing, and persistent. Open content may disappear or become commercialized, thus endangering access to what had been collective evidence, narratives, history, and memory. Scholars face changing requirements of US federal government agencies⁸⁴ and private foundations⁸⁵ that dictate the terms of access to and use of research results. Among the many issues presented in the research and publication flow are the contextual nuances in the use of the terms “open” and “rights,” in addition to “proprietary” and “transparency.”

Digital literacy also plays out in many creation and dissemination methods other than formal publishing. Think of such examples as 3D printing, game development, student portfolios, electronic theses and dissertations, online exhibits, open educational resources, digital repositories, digital humanities, online teaching and pedagogy models, research information management systems, collaborative platforms, preprint servers, content mining, and inventions. All of these activities demand engagement with content, technology, intellectual property, privacy, and policies. One example, 3D renderings, can be either digital or physical. They may be a means of exploring shape and function, a final product, or a prototype for something to be produced in a different medium. They may borrow from the work of others or present their own IP issues. Likewise, visualizations may serve as a means to gain understanding of data or a phenomenon, or may communicate, represent and interpret research results in the form of presentations, posters, exhibits, moving images, publications, and the like. They often build upon the work of others and may rely heavily on technology and permissions.

The creation and reuse of data has become a focal point of scholarly communication and research. Given that most research data are created digitally or converted to a digital form to enhance analysis, data information literacy can be placed within the frame of digital literacy. The collection, coding, and curation of data is well-covered in the literature; less common is the placement of data within the

context of information and digital literacy. The Association of College & Research Libraries' (ACRL) white paper on the [Intersections of Scholarly Communication and Information Literacy](#) identifies data literacy as “an area where the impact of external forces, ranging from the increasing demand on students to find and use data to funder mandates to have data management plans, point to a critical area of intersection between scholarly communication and information literacy.”⁸⁶ Preferring the term “data information literacy,” Shorish emphasizes “the need for students to understand how data can be reused, what sort of quality assurances should be made on the data, and which data is implicitly gathered and reused all the time by virtue of our online interactions.”⁸⁷

Further, consider the complexity of playing the dual role of the scholar as creator and consumer — conducting research and producing new knowledge, while depending on ready access to the knowledge of others. Ownership and rights can be unclear; algorithms and bias can affect the discovery, reach, and influence of creative works; and measures of quality and impact can be influenced, manipulated, misunderstood, or misleading.^{88, 89, 90, 91} In addition, scholars must simultaneously manage their careers, digital presence and reputation, and the visibility of their research and accomplishments. To be a responsible navigator and creator in the digital world, both aspiring and seasoned scholars must become informed advocates for new enablers of creativity and champion the acceptance of new forms of scholarship in policies and standards that govern assessment and rewards. Scholarly communication will thrive when the interplay of digital elements and systems are understandable and adaptable to emergent ideas and forms.



Conclusion

The preceding discussion has focused on digital literacy's present and recent history, with an examination of projects and frameworks currently in use or produced during the past few years. To conclude the brief, this section explores the future of digital literacy, extrapolating from present trends and anticipating new developments.

The digital world excels at developing new iterations to current technology and offering entirely new technical categories, so organizations and individuals should be prepared to extend their frameworks to address them. Already virtual and augmented reality are starting to enter popular usage, which means they will host content that can be apprehended through information and media literacies. What considerations will apply as VR and AR production become part of digital literacy? Moreover, as VR and AR meld into mixed reality ("MR"), educators and thought leaders should prepare to apply concepts of literacies to that potentially revolutionary new medium.

Similarly, as blockchain technology matures, users may create, access, and share information other than Bitcoin across platforms built upon it. Projects like [LBRY](#)⁹² and [Ethereum](#)⁹³ can host content and communication, and therefore should fall under the consideration of both information and digital literacy. There is a need to think critically about what it means to use these outlets either for consumption or production, and therefore to explore how digital literacy frameworks apply to them.

Artificial intelligence has developed rapidly during the past decade, and appears poised for takeoff. Already there are "intelligent" tools to help users learn languages, write prose, reimagine images, and co-create music. The Chan Zuckerberg Initiative is applying Meta, an AI tool, to the body of medical literature, in order to speed discoveries and idea sharing.⁹⁴ All of these developments and possibilities give rise to powerful questions. How does the creation of knowledge change with nonhuman guidance? What will creativity mean when software can assist in creating digitally? Can machines demonstrate inspiration?

To address digital literacy directly in the future, will a digital literacy assistant or tutor extend this work? How will people teach themselves to critically assess the role of AI in the digital world, from basic uses such as the use of algorithms to shape user experience to powerful applications like understanding bias in a work produced entirely by software? How should curricula change in order to account for the growing role of AI in assisting the work of research, analysis, and creation?⁹⁵

Just how profound an impact will AI have on digital literacy? It could boost the collective creative output through economic effects. For example, if increasing automation increases human un- and underemployment, this could result in more time for creative expression. Alternatively, automation may exclude non-creative jobs and services from human use, rendering creative jobs and services as the main area for human employment. In that case, creativity becomes even more important than it is now.

On a more human front, as some online behavior becomes increasingly hostile and as more people go online for the first time, it is possible to expect bullying, trolling, doxing, and other forms of abuse to grow. One way to address this challenge is to expand emphasis on the personal and social facets of digital literacy discussed earlier. This should include greater focus on a critical approach to technology itself, including its real-world uses. That in turn could mean expanding the role of socio-political implications in coding, either in general digital literacy work that includes such skills, or in computer science. Other solutions may lie in rethinking the structure of digital environments in order to reduce online cruelty, perhaps with the assistance of artificial intelligence.

On a related note, there has been a recent boom in “fake news,” false stories or misinformation promulgated for commercial and/or political effect. Obviously, this is a problem where information and media literacy come into play, but digital literacy expands the collective response. The latter reminds users to be critical about materials when sharing and building upon them, as digital literacy is often a concept predicated on the existence of the social web. The structures behind fake news, whether political, commercial, or other, should also be subject to an understanding informed by digital literacy.

Politics may increasingly come to play a part in digital literacy, as recent events have sharpened awareness in many countries of the links between media, power, technology, information, and justice. A recognition of the social context for digital information searching, assessment, creation, and sharing could well become a central part of digital literacy definitions and standards. Given the diversity of political stances, divergent models could also surface, or even oppositional frameworks. Defining what social context means and by what criteria learners judge digital actions and documents could become both conflicted and widespread.

Finally, as technologies grow and new uses proliferate, the meaning of digital literacy will continue to evolve. New tools and practices will confront us with the possible needs for new skills. Moreover, as seen in this report, while content creation is crucial to the topic, a good number of frameworks prefer to emphasize consumption. Yet as digital tools continue to become easier to use, more accessible, and also more powerful, using them for creative expression will likely become more prevalent within these models. The social demand for creativity appears likely to grow, be it from the knowledge economy’s requirements, the needs of a political sphere fraught with disinformation and passionate division, or the ancient and undeniable human love of stories. At some point, production may become as essential to digital literacy — indeed, to social life — as consumption. If that future comes to pass, now is the time to creatively and collaboratively prepare for it.

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