NMC Horizon Project

2017 Digital Literacy Impact Study

An NMC Horizon Project Strategic Brief

Volume 3.5, November 2017

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The *2017 Digital Literacy Impact Study: An NMC Horizon Project Strategic Brief* examines how digital literacy training in higher education affects the occupational success of postgraduate learners as they enter the workforce. Supported by Adobe, the aim of this research is to understand how the digital learning experiences that college and university students were exposed to while pursuing an undergraduate degree impact and influence current employment roles, responsibilities, and functions.
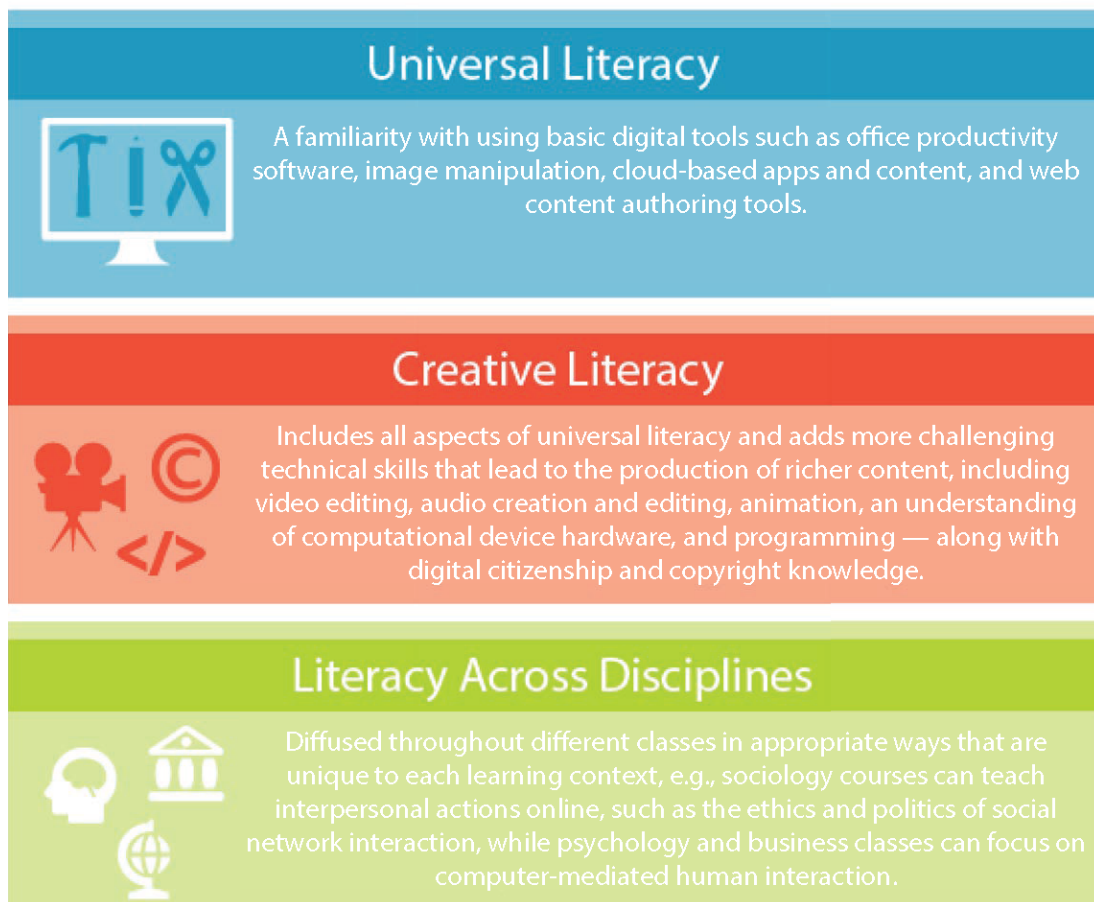
This research follows the 2016 publication, *Digital Literacy: An NMC Horizon Project Strategic Brief,*[1] which outlines key definitions (as seen in the graphic below), models, practices, and recommendations for improving digital literacy. In thinking

"The ability to interpret, understand, comprehend, and utilize digital resources whether [or not] that be simply resources that you are accessing and creating digitally."
−NMC Digital Impact Study respondent on defining digital literacy

about digital literacy education, the purpose is to not only enhance curriculum, but also to apply tangible experiences to prepare postsecondary learners beyond the degree. In addition, this study complements the 2017 publication *Digital Literacy in Higher Education, Part II: An NMC Horizon Project Strategic Brief,*[2] which explores how higher education institutions are creating authentic learning experiences and frameworks for digital literacy education. This report offers insights on digital literacy learning from the postgraduate perspective, specifically what is being learned, utilized, and applied in the workforce. It also shares how postgraduates use digital literacy skills, specifically universal literacy, creative literacy, and literacy across disciplines, in the workplace.

Three Models of Digital Literacy

Universal Literacy

A familiarity with using basic digital tools such as office productivity software, image manipulation, cloud-based apps and content, and web content authoring tools.

Creative Literacy

Includes all aspects of universal literacy and adds more challenging technical skills that lead to the production of richer content, including video editing, audio creation and editing, animation, an understanding of computational device hardware, and programming — along with digital citizenship and copyright knowledge.

Literacy Across Disciplines

Diffused throughout different classes in appropriate ways that are unique to each learning context, e.g., sociology courses can teach interpersonal actions online, such as the ethics and politics of social network interaction, while psychology and business classes can focus on computer-mediated human interaction.

These three models of digital literacy require skill development and relevant learning experiences. Higher education institutions are infusing these literacies into curricula and programs, but what is not known is how these digital skills function in the world of work. How are learners managing these digital literacies when they graduate? What digital skills and literacy needs do recent hires require to be successful? What digital literacy applications are required for today's workforce?

The influx of technologies and automation in the workplace[3] is having a ripple effect on both industry and education. Rapid technological changes are demanding additional professional expertise, which requires both education and employment agencies to reexamine the link between these sectors to meet these evolving expectations.[4] Lifelong learning is essential to thrive in a lifelong career. In a recent Pew Research study, more than half of adults (54%) in the labor force believe training and development of new skills will be essential throughout their career to keep up with changes in the workplace.[5] A number of workers are earning credentials or another degree, completing a course or certificate, upskilling in a webinar or training session, attending professional conferences and events, or retooling to learn a new skill in a massive open online course. Professional learning in the future will require contribution, participation, and connection from those inside and outside the workforce.

As the technology revolution unfolds, the future of the professions is also expanding. The world of work is presenting opportunities for productivity and efficiencies with automated technologies, such as robotics and artificial intelligence; however, it does not identify the broader impact automation will

"[It's] … having enough experience with digital technologies that you form a basis to learn about new technologies … this helps to reduce the effort."
–NMC Digital Impact Study respondent on the importance of being exposed to digital literacies

have on employment, income, and skills.[6] Predictions are that 65% of the jobs GenZ will perform in the future do not even exist yet.[7] This makes it critical for workers to be agile, adaptable, and willing to continue to learn if they are to be employable in the future digital world of work. Additionally, workers who freelance or who have embraced the "gig economy"[8] will need to find learning and training benefits independent of a formal employer. To remain competitive in today's labor market, it will be imperative for all workers to train and learn throughout their career journey.

In contemplating the future of work, with regard to the skills and attributes in demand, it is critical for higher education institutions to understand how digital literacy impacts learners at work. This impact study investigates how the concept of "digital" is influencing postgraduates' occupational life in terms of experiences, applied skills, and continuous learning. Additionally, "literacy" is the means and methods for how workers can use knowledge to be proficient with a variety of media resources as it intersects information and professional domains.

For decades, society has been shifting from a "labor society" to a "knowledge society."[9] This change has required the industry sector and higher education institutions to rethink their contributions to this knowledge economy. This new technological paradigm in education and employment places value on the community rather than on information or the knowledge commodity. The value is now the power of the networks that connect people, places, and ideas. The knowledge or information society is a technologically upgraded version of the industrial society that has access to "a global network of power without social control or, alternatively, the emergence of a network of interacting cultures, unified by a common belief in the use value of sharing."[10]

In this networked society, the role of education needs to shift toward a more self-directed and collaborative approach that includes learning with peers. For K–12 education stakeholders, the International Society for Technology in Education (ISTE) has created ISTE Standards for Educators[11] to develop digital learning pathways that empower students to be part of the learning process. It is now imperative for higher education entities to share authentic ways to develop self-directed and involved learners within our curricula to support digital literacies.[12]

In predicting the future of jobs, the *World Economic Forum: The Future of Jobs, January 2016* report[13] developed a cross-functional work-related skill set based on jobs from the *Occupational Information Network (O*NET)*[14] and the US Department of Labor's Bureau of Labor Statistics' *Standard Classification of Occupations (SOC)*.[15] This O*NET-SOC taxonomy detailed 350 occupations to streamline a set of cross-functional skill families, such as complex problem-solving skills, resource management skills (e.g., financial, time, people, and material), social skills (e.g., emotional intelligence, coordination, persuasion, negotiation, service, and training/teaching), system skills (e.g., decision making, analysis, and judgment), and technical skills (e.g., repair/maintain equipment, operation, quality control, user experience design, and troubleshooting).[16] With emerging technologies and evolving workplace demands, employers in the future will be seeking out the following skills to meet the needs of their organizations:

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

Organizations are beginning to forecast the labor needs and the employee requirements to sustain industry and occupational training on the horizon. The Pew Research *Future of Jobs and Job Training* report[17] identifies five major emerging themes as we prepare professionals for the digital age of work:

1. The training ecosystem will evolve, with a mix of innovation in all education formats.
2. Learners must cultivate 21st-century skills, capabilities, and attributes.
3. New credentialing systems will arise as self-directed learning expands.
4. Training and learning systems will not meet 21st-century needs by 2026.
5. Jobs? What jobs? Technological forces will fundamentally change work and the economic landscape.

The occupational needs may vary from company to company, but common skills families will be essential for preparing the next generation of workers. In particular, higher education is witnessing a shift in employment needs as the job market evolves to meet the growing technology demands in society. Most good-paying jobs in the United States, with median earnings of $55,000, require at least some postsecondary education and training in the skilled-service industries.[18] We are witnessing a shift in employment needs as the job market evolves to meet the growing technology demands in society.

LinkedIn reported the top skills employers are hiring for in 2017. All of them were tied to technology and most require some form of learning or retraining effort. The top skills included cloud computing expertise, data mining and statistical analysis, smartphone app development, data storage engineering and management, user interface design, and network security expertise.[19] With this type of technological demand, there is less emphasis on a formal degree and more interest in skills-centered initiatives to consider new ways to train, credential, and support professional development in the workplace.[20] To ensure productivity in their organizations, employers are also seeking out particular soft skills to complement a candidate's technical expertise. In a recent National Association of Colleges and Employers (NACE) survey, over 70% of employers indicated they examined a student's resume for the following attributes: the ability to work in a team, problem-solving skills, communication skills (verbal and written), and a strong work ethic.[21] LinkedIn's *Global Recruiting Trends 2017* report[22] identified six top attributes recruiters and hiring managers are looking for as they identify the soft skills:[23]

1. Adaptability (e.g., curiosity);
2. Culture fit (e.g., communication and open-mindedness);
3. Collaboration (e.g., emotional intelligence and teamwork);
4. Leadership (e.g., innovation, integrity, and creativity);
5. Growth potential (e.g., ambition, problem solving, and drive); and
6. Prioritization (e.g., time management, organization, and decision making).

In examining the list of job attributes in demand, these desired skills can be embedded into digital literacy development for higher education learning and beyond the degree in the workforce.

Higher education's role for digital literacy will be to identify how these educational and skill development experiences are being utilized in the workforce. The *2017 NMC Digital Literacy Impact Study* was designed to uncover the learner's perspective of how digital literacy training influences occupational life after graduation. How do "digital" needs impact career success? How do learners apply this type of literacy to their daily work? Has the undergraduate learning experience, specifically with regard to digital literacy, been applicable to their employment? Additionally, how are postgraduate learners continuing to retool and learning to enhance their digital literacy skills for their professional career? As the professions shift with the changes in technologies, knowledge-based, networked careers will require a wide range of capabilities and competencies.

A total of 727 recent graduates from four-year universities (82.5%) and two-year colleges (17.5%) completed the 2017 NMC Digital Literacy Impact survey in April-May, 2017. The majority of respondents graduated with their undergraduate degree in 2015 (42.7%) and 2016 (41.5%). The median age of the sample was 24, with a gender composition of 55.6% male, 42.9% female, and 1.5% who declined to state their gender. A diverse mix of academic disciplines was represented; however, the most common majors listed were business, psychology, communication studies, English, and political science. Over half of the recent graduate survey respondents reported being currently employed in education, medical/health services, technology, engineering, and government (see Table 1 in the Appendix).

The purpose of this study was to explore the student perspective of digital literacy learning experiences and understand how these skills are currently being applied to the workforce. We asked participants to indicate how their previous digital literacy training and exposure in higher education impacted their ability and engagement with technology after graduation.

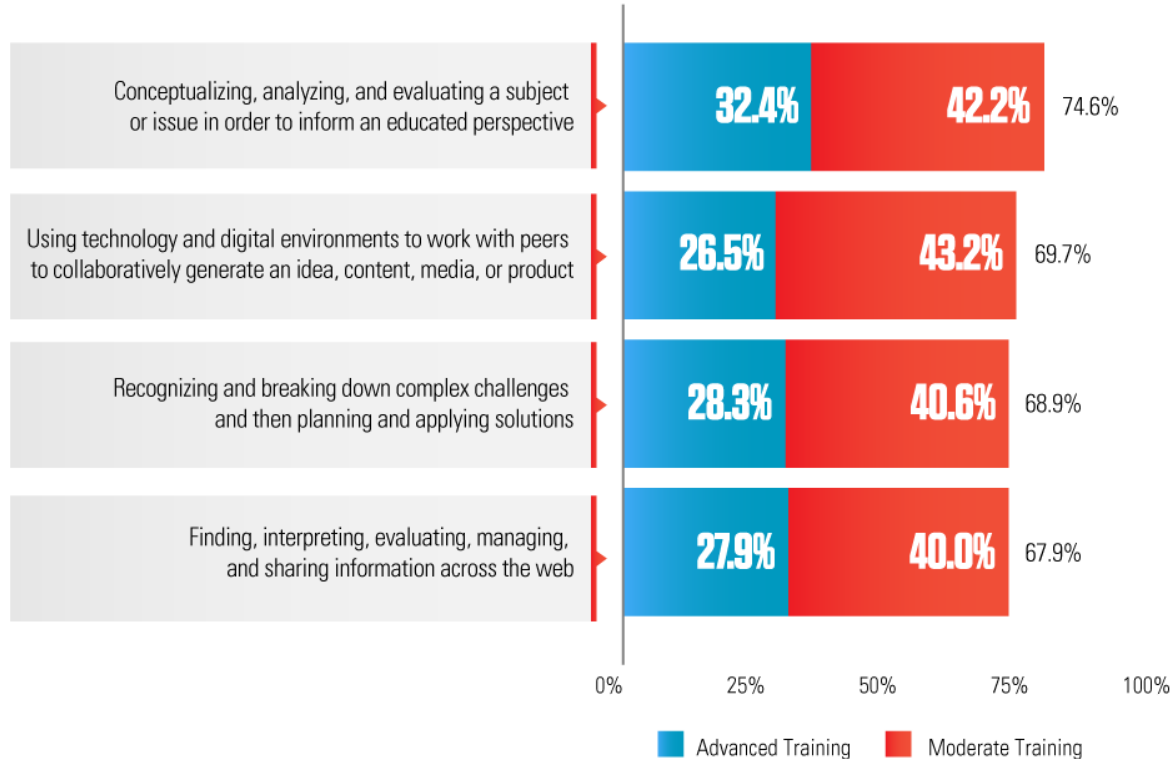## Figure 1. Level of Undergraduate Training: "Advanced" + "Moderate" Combined Totals

Figure 1: Many postgraduates reported exposure to digital skills that require interpreting, evaluating, planning, and searching for information online. Most undergraduate curriculum degrees require learners to organize research findings and share for required course projects or assignments. Beyond this, Figure 1 identifies that a number of learners use technology and digital environments to work collaboratively with peers to manage complex problems, apply solutions, and generate ideas to reach their educational goals.

Digital Literacy Exposure

Students who are exposed to digital literacies in higher education begin to develop digital skill competence. College and university curricula often encourage learners to engage in some form of digital research and exploration. Typically, specific courses, projects, or experiences allow for digital skill

development combined with collaborative group projects, problem-solving activities, and the use of technology to gather and share information. Respondents to this survey specified that applied technical courses (e.g., research, business, graphics, and web applications/development) were at least partially responsible for the advancement of their technical abilities and digital literacy. In thinking about these common pedagogical approaches and practices in higher education, we were not surprised to learn that most respondents indicated they received the greatest amount of training (moderate or advanced) as undergraduates to conceptualize, analyze, and evaluate a subject or issue in order to inform an educated perspective (74.6%); use technology and digital environments to work with peers to collaboratively generate an idea, content, media, or product (69.7%); recognize and break down complex challenges and then plan and apply solutions (68.9%); and find, interpret, evaluate, manage, and share information across the web (67.9%). Learners are often instructed to read, review, and consume information for assignments and projects (see Figure 1 above and Table 2 in the Appendix).

In examining digital tool experiences in undergraduate education, there seemed to be limited use and minimal application of digital technologies for learning. Postgraduates are often exposed to online platforms or digital resources for inquiry-based assignments and to create presentations of their work. The survey found that 30.9% of the respondents used digital tools to research and curate web content (e.g., finding and sharing online articles, reports, and other forms of research) and 28.1% utilized a form of digital communication (e.g., creating slides, infographics, or other products to showcase work) for a project (see Table 4 in the Appendix). Many postgraduates in this study identified specific coursework and assignments — in particular, those where technology was utilized or required to foster peer collaboration, study skills, collection, and/or presentation of information — that helped to develop digital literacy skills. Examples of undergraduate activities for digital literacy development included the following:

- Research strategies for collecting and curating information
- Presentation applications and skills
- Access to digital information
- Graphic and content design
- Multimedia and video production
- Social engagement and collaboration
- Programming and databases

Digital Skills Gap

Digital skill development occurs when digital literacies are applied: creation, production, and development with digital tools. The survey findings begin to address what is missing from digital literacy learning in undergraduate education: applied, pedagogical approaches to learning with technology. Postgraduates have identified a gap in their digital skills set with regard to production and experiences with digital tools. Respondents indicated they received minimal or no training for production of content in digital formats, specifically media, such as video, audio, or graphics, (63.4%) and mobile assets, mobile apps, podcasts, or ebooks (79.4%) (see Figure 2 below and Table 2 in the Appendix. These findings indicate that most of the digital literacy training in higher education is directed toward consumption and evaluation of information and media, and not on the creation of products using digital resources. Additionally, postgraduates expressed that they had minimal or no training in the use of digital artifacts to communicate ideas or stories (51.1%), and they indicated they were given minimal guidance around the laws, rights and responsibilities, and security for using

"These findings indicate that most of the digital literacy training in higher education is directed toward consumption and evaluation of information and media, and not on the creation of products using digital resources."

technology and media (58.1%). These responses mirror the limited experiences undergraduates have to practice with these digital tools.

Postgraduates also indicated they had minimal to no experience with website design and application development (79.5%); digital storytelling, e.g., producing media with a narrative voice, often combining video, images, and sound to tell a story (71.4%); and media production/editing, e.g., creating and editing video, audio, photos, or graphics (71.2%) (see Table 4 in the Appendix). It is imperative for us to provide undergraduate students with hands-on exposure to digital tools that allow them to experiment and play. To develop digital literacy, we need to encourage learners to take ownership of their work by generating digital artifacts and finding ways to create evidence of work, showcase their experiences, craft their own narrative, and participate in the collective web. By actively engaging learners in the practice of digital skills and application of knowledge through technology media, higher education institutions encourage a stronger consciousness of digital awareness, prowess, and responsibility.

Figure 2. Level of Undergraduate Training: "No Training" + "Minimal Training" Combined Totals
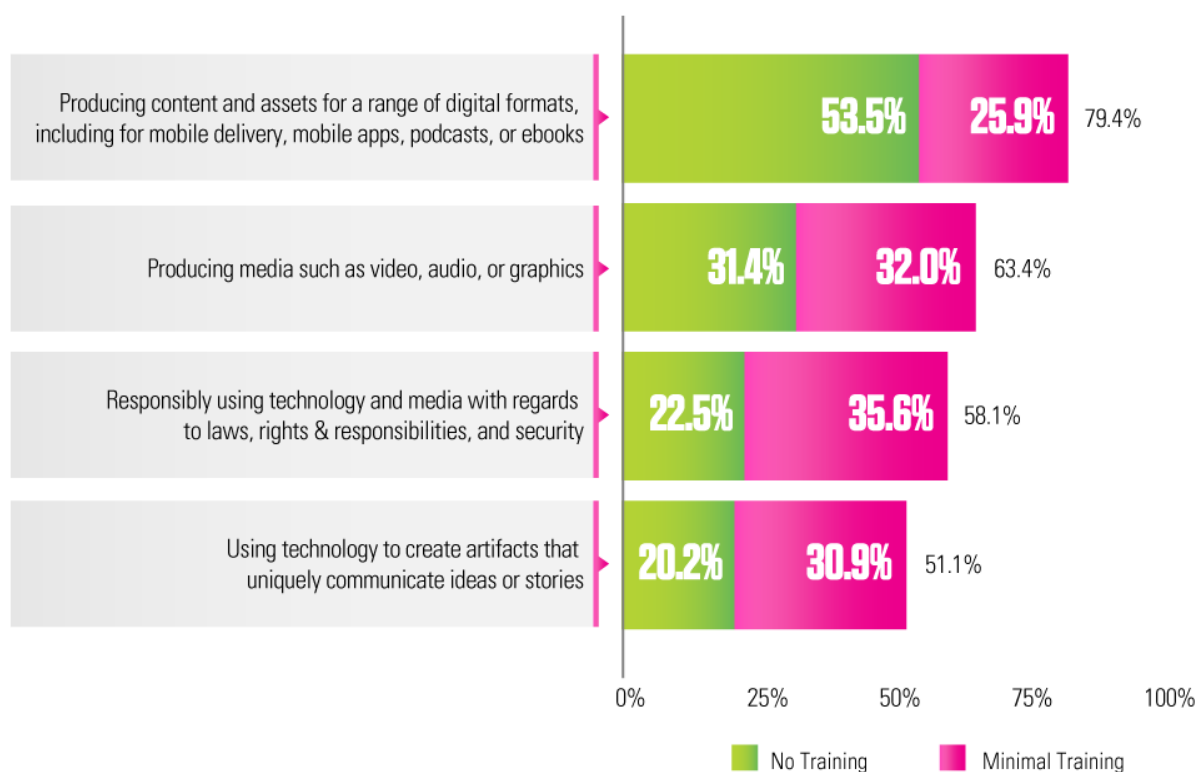

Figure 2: The gaps in technology training for undergraduates are primarily concerned with digital production and responsible use. Figure 2 identifies that digital literacy development could encourage learners to design content with technology to deliver information, communicate ideas, and share stories in different media formats, such as mobile apps, podcasts, ebooks, videos, or graphics.

Digital Literacy for Employment

Digital literacy training and experiences in higher education help learners transfer these skills and knowledge to the workforce. To understand how digital literacy development in higher education is impacting work, postgraduate responses offered insights into how digital skills and knowledge are applied to their occupational success. A majority (69.6%) of postgraduates believe they were prepared to do their work when starting their job; 57.8% received positive job performance evaluations regarding

their digital skills; and over half (52.7%) indicated they earn comparable pay to similar professionals in their field (see Table 6 in the Appendix). In learning about previous digital literacy training from college and university students, it is not surprising to discover that respondents are very confident in their abilities to understand and solve complex problems (75.5%), find and interpret online information (72.6%), analyze and evaluate an issue to find a solution (72.1%), and work collaboratively with work colleagues in digital environments (72.1%) (see Table 3 in the Appendix). Postgraduates reported researching and curating web content (35.4%), problem solving in digital environments (32.8%), and utilizing digital communications (31.4%) within their current job functions (see Table 5 in the Appendix). These responses echo the postgraduate learning experiences with digital training and abilities highlighted above, which might explain why these digital tools and skills are being incorporated into their professional roles.

In contrast, the majority of respondents indicated that they rarely or never engage in the following digital skills in their occupational role: website and app development (75.1%), digital storytelling (69.1%), media production/editing (63.6%), and social media content creation/sharing (62.9%) (see Table 5 in the Appendix). Composite measures of undergraduate training, confidence in areas of digital literacy, level of undergraduate experience, work activity engagement, and occupational success were generated by summing the respective response scores of the items for each variable. Overall, the strongest correlation was found between undergraduate training in digital literacy and level of experience (0.764) as indicated in Table 7 in the Appendix. Put simply, this means that there is a stronger-than-typical positive relationship between undergraduate training in digital literacy and the level of undergraduates' experience with digitally literate activities. While correlation does not prove causation, this does prove a positive relationship between the variables — as one increases so does the other. Additionally, undergraduate training was more closely correlated with occupational success in comparison with the other digital literacy variables with a correlation coefficient of 0.608 (see Table 7 in the Appendix).

The findings indicated that all digital literacy factors showed a statistically significant ($p = 0.608$), positive linear relationship with occupational success. Therefore, as undergraduate training, confidence in areas of digital literacy, level of undergraduate experience, and work activity engagement increased, the level of occupational success increased as well.

Learning and Digital Upskilling on the Job

Exposure to digital literacy experiences in higher education encourages continuous learning of digital skills and knowledge. Digital literacy development in postsecondary education offers students the ability to move forward and encourages curiosity in their future careers. Almost half of the survey respondents indicated that exposure to and practice of digital literacy skills as an undergraduate student helped prepare them for the workplace and prepared them for their current employment position. The digital literacy exposure offered within higher education creates an awareness and access to understanding technologies and digital skills sought after in an occupational setting. Note that 35.1% of postgraduates feel more accomplished in their profession because of their digital literacy training as undergraduates, and 38.3% have received a promotion within the last year (see Table 6 in the Appendix). As a result of higher education's digital literacy preparation, many respondents have increased confidence in their ability to utilize technical skills on the job (e.g., software and technology application, research and sharing of information), to maintain relevancy in their occupational field, and to advance their communication and collaboration skills.

Not all who responded felt digitally prepared by their undergraduate degree program. Some postgraduates disagreed about their digital literacy competence with regard to occupational success, and 39% indicated they engage in regular training to get up to speed on the digital skills required to excel at their job (see Table 6 in the Appendix). Additionally, respondents felt that many of these skills were self-taught. Many postgraduates indicated that they acquired these digital competencies outside of their academic program and institution.

All postgraduates reported that digital skills required a continuous need for training on digital literacy beyond the degree program.

Although postgraduates may not have gained specific digital literacies from their college and university experiences, they have benefited from being encouraged to be self-directed and self-motivated in their learning. Digital literacy training seems to offer learners the ability to explore different concepts and develop new proficiencies, which, in turn, cultivate their aptitude for continuous learning and development. All postgraduates reported that digital skills required a continuous need for training on digital literacy beyond the degree program. This training includes learning new software and hardware, troubleshooting technical issues, processing large amounts of information, problem solving on digital teams, creating media content, and developing a digital awareness for relevant technological needs in their specific industry or occupation. The introduction to digital skills and literacies allows our learners to foster openness for learning and preserve an inquisitive mindset to support upskilling in the profession. With the changing technological landscape of work, employers are seeking candidates who are agile and can learn on the job to meet the developing occupational demands.

THE IMPACT OF DIGITAL LITERACY:
Profiles of Three Recent Graduates

PERSONAL INTERVIEWS CONDUCTED BY THE NMC

CARLY

MAJOR: History / **MINOR**: Museum Studies

CURRENT POSITION: Librarian at a junior college

HER DEFINITION OF DIGITAL LITERACY: The ability to understand, comprehend, and utilize digital resources — whether you're simply accessing or creating those resources digitally

HIGHER ED EXPERIENCE: She was required to keep blogs, with courses in her major that taught coding and web design. She also learned graphic design and graduated with a general awareness of digital footprint.

IMPACT ON CURRENT JOB: While she started in a role purely dedicated to circulation, she since has been brought up to manage digital initiatives with the learning management system team because of her coding background

Overall, she identifies as digitally aware — she can understand and strategize for the bigger "digital picture," e.g. how to make resources as accessible to as many people as possible.

IMPACT ON FURTHERING CAREER: University courses gave her the "craving" to learn more by educating her on anticipating the future digital climate. The basic skills she learned will not only help her stay afloat in the workforce, but also provide her with learning capabilities to continuously move forward — with professional development encouraged.

CHRISTIAN

MAJOR: English and Computer Science

CURRENT POSITION: Game designer at a mobile game company

HIS DEFINITION OF DIGITAL LITERACY: Having enough experience with technology that you form a digital basis to learn new tools and new forms with reduced effort

HIGHER ED EXPERIENCE: Prior to starting university, he had no formal computer programming training but an interest in coding. He took new media study courses that bridged the gap between English and computer programming that helped him understand the humanities and storytelling concepts as well as web design and social media. Additionally, he developed analysis skills that are crucial for expanding digital literacy.

IMPACT ON CURRENT JOB: He uses coding, databases, and query languages as he is constantly examining, organizing, and moving data for game content. He is also Involved in designing the creative narrative elements of the game, including themes, environment, and characters.

IMPACT ON FURTHERING CAREER: The flexibility he gained is key, with the aim of continuously learning. He believes being exposed to programming and acquiring skills to create narrative content and analyze digital text will help him advance.

DEVINEE

MAJOR: Journalism (with a focus on Advertising)

CURRENT POSITION: Advertising sales at a multinational online corporation

HER DEFINITION OF DIGITAL LITERACY: Understanding the nature and extent of what is possible in the digital realm, especially as it relates to deciphering and selecting the best methods of communicating digitally for each specific activity.

HIGHER ED EXPERIENCE: Digital literacy was not an inherent part of her education, though there were some design tutorials available at the campus library. However, she took it upon herself to learn graphic and web design, and when she incorporated it in her journalism courses, she observed that she stood out from her peers and received praise from her professors. Her digital learning and advancements were primarily self-initiated. She pursued independent studies and certifications based on needs that aligned with her career goals, subsequently learning about online community management, managing online reputation, and interpreting online data and analytics.

IMPACT ON CURRENT JOB: She did not feel her university experience directly contributed to success in her specific role; instead, the skills she acquired through her self-directed learning helped her get the position she wanted and be effective in it.

IMPACT ON FURTHERING CAREER: Her self-motivated independent learning cultivated a lifelong habit of continuing professional development outside of work.

The future of the professions and the nature of work are shifting. Participants in the educational pipeline leading to higher education — along with higher education institutions in particular — need to consider how to best prepare our learners beyond the degree to support digital engagement in both professional and civic lives. By supporting digital literacy efforts, postgraduates are able to obtain the skills, experiences, and aptitude to continue learning about technologies they will encounter after graduation.

From this impact study, we have learned how critical it is to cultivate digital literacies in our higher education learners, specifically with regard to how these skills and experiences will contribute to a rich career path. Both practical training and applied learning of digital literacies provide postgraduates with the propensity to thrive in work environments and encourage the continuous learning needed to improve digital skills for employment development.

As technologies impact education and employment, higher education institutions will need to think about how to foster digital literacies and digital skill development. How can colleges and universities solve the digital skills gap facing industry? Now is an apt time for all sectors invested in learning and work to come together to solve this problem in a holistic way. The following three recommendations are shared to encourage collaborative partnerships that will advance digital literacies and skill development in higher education and lead to occupational success.

1) Assess Digital Literacy Gap with Industry Partners

In examining digital literacy initiatives at individual institutions, postsecondary schools will need to conduct a needs analysis. The 2016 *Digital Literacy: An NMC Horizon Project Strategic Brief*[24] encouraged the building of industry — education partnerships and smart collaborations to address the rapid demands that technology is imposing on jobs, learning, and society. To cultivate a highly skilled digital talent pool of strong computational thinkers, educational institutions need to partner with industry to identify the digital skills gap. To enhance postgraduate occupational success, digital literacy programs and initiatives will have to align with the needs of the training and learning systems to meet the requirements of 21st-century companies.[25] Including digital literacies and skills in postsecondary education practices allows learners to accept risk, experience failure and uncertainty, adapt, and innovate before requiring them to apply these same competencies in an occupational setting. How can higher education design education programs and work-integrated learning models that benefit academic goals, industry needs, and learner interests?

Employers have an important role in identifying needs and skills gaps found in workplace training and development. Companies are beginning to think about how to integrate digital literacy and skill development on the job. Accenture itemized the digital demands and agile skill sets of future jobs in its *Liquid Workforce* report.[26] Additionally, academic programs could integrate more applied occupational experiences into the current curriculum, such as transition into work, job shadowing, and informational interviews. Multisector collaborations and partnerships are a necessity to scaffold future jobs and digital skills. Both academic institutions and industry affiliations need to work together to scale strategic digital literacy solutions.

The industry sector will need to be involved in workplace training and exposure to practical experiences that complement postsecondary education. This might involve infusing experiential learning, applied problem solving, and on-the-job training capabilities while learners are in their undergraduate program. It will be critical for education stakeholders to partner with employers to identify and address

potential barriers for including digital literacies, specifically those skills and experiences required for adaptation to technological change. By examining the World Economic Forum's *Skills for the Future* resources[27] and *The Future Jobs* report,[28] higher education institutions and the industry sector can work collaboratively to establish the digital competencies needed for today's learning and work environment. These joint digital literacy initiatives can help to strengthen the talent pipeline from education to industry, while also developing learners' knowledge and skills for the relevant technologies that are changing the way we work.

2) Redesign Learning and Development Systems

Colleges and universities need to rethink and reconceptualize education systems and training for the future of work. What might postsecondary curricula look like to meet the industry needs of the future? How can higher learning educators begin to evaluate institutional programs, specifically training, learning, and curricula, to understand how they support the labor market? Redesigning learning and development programs will require labor market data, career planning and mentorship to support learners, and the integration of relevant digital literacy learning. Looking at the future of training and learning, none of the sectors of education will remain the same. The new training and learning ecosystem will require a mix of training modes and education formats to support the needs of 21st-century industries.[29] For effective talent development redesign, all levels of education will need to consider how education systems are contributing to future occupational needs and professional fields.

Integrating digital literacies into curricula requires workforce and education stakeholders to identify the opportunities, knowledge, and competencies relevant to industry that higher learning organizations should capitalize and develop. Interventions could include formal and informal education systems or means that recognize the different skills that make up digital literacy and their relative importance from a labor market perspective. Postsecondary institutions need to offer clear guidance on how to interpret and understand a degree's translation into professional work, similar to the *Georgetown University's Career Pathways* initiative.[30] It is time for colleges and universities to provide meaningful information about degree attainment for students, families, and employers to understand the value of postsecondary credentials in the current labor market.

Collectively, higher education and industry partners will need to develop a data strategy to build evidence for both policy and program designs. Further research is needed to develop a more granular understanding of the talent supply and demand across various professions and industry sectors with the goal of offering effective education and training preparation. To fill the gaps for digital literacy, all stakeholders will have to monitor effectiveness to further understand the needs for the knowledge economy. To effectively redesign learning systems, industry and education leaders will need to find ways to share labor market information, offer access to employment/education mentorships, and navigate the crosswalk between career and academic planning to best align individual learners' goals with industry expectations.

3) Cultivate Lifelong Learning

To equip learners with the skills and knowledge required for future occupational success, postsecondary institutions need to expand where and how learning takes place. Over the course of a career, postgraduates will need to earn alternative credentials, develop new skills, and tool up while in the workforce.[31] To enable lifelong learning and rapid job-specific upskilling, retooling, and retraining, formal education will not be enough to attain all of the competencies or knowledge required for employment. The learning journey does not and should not end at the completion of a degree program.

Creating an environment where lifelong learning is the norm will require colleges and universities to position themselves as places for continuous learning and ongoing professional development. This reset will need to go beyond offering graduate and professional degree programs. To remain ahead of the curve in an environment of rapid technological change, it will be important to provide constant upskilling and retraining within the education system and with the support of industry leaders. Organizations, like Deloitte, are thinking about how higher education institutions can support lifelong learning for the new normal student — one who is working full time while completing a degree program and also developing a stackable credential or skill-based certificate in a massive open online course (MOOC).[32] To be relevant in this shifting economy, postsecondary education leaders need to consider ways to offer training opportunities and provide thoughtful consideration for how best to support learners as they enhance their skills while working.

Higher learning educators need to instill a sense of self-regulation and self-direction beyond the degree program if postgraduates are to be relevant in their occupational roles. Learners who were exposed to digital literacy learning or digital skill development gained confidence in their ability to learn beyond the course requirements and figure out ways to navigate technical issues. To retool or upskill, postgraduates are taking advantage of online resources and open materials for the needs of their current roles and responsibilities. A number of learners and workers are supplementing their abilities with Khan Academy[33] videos, learning skills from *Lynda*[34] course, or picking up additional knowledge from one of the many MOOC and open course providers[35] online. To enhance media or web content development, postgraduates might visit *Google for Publishers*,[36] *Treehouse*,[37] and *Smashing Magazine*[38] for design and publishing strategies. Or to enhance digital experiences on coding platforms, postgraduates might look to open-source game programming tools, like *Twine*,[39] to tinker with and even join open-source communities, like *GitHub*,[40] to collaborate on coding projects.

The responsibility for lifelong learning is also part of industry development, as employers develop partnerships with education providers or design in-house training opportunities for digital literacy learning. In JPMorgan Chase & Company's *Swiping Right for the Job* report,[41] the skills gap for matching digital prowess with their industry role identifies the challenges for the future labor market, specifically the lack of technological access, relevant knowledge, and professional learning networks of their workers. PwC offers employees on-demand courses, like *Data Analysis and Presentation Skills*[42] on the *Coursera for Business* platform, to develop its talent network. Other companies are thinking about ways to offer microcredentials for specific digital literacies to encourage employability in this technology-infused labor market. Network engineers can join the *Cisco Learning Network*[43] to prepare certification tests, interact with professionals, and find opportunities to mentor and share with peers in the community. *Salesforce* offers a free interactive, learning platform, *Trailhead*,[44] to help professionals acquire skills and gain proficiency with the *Salesforce* Customer Relationship Management platform. The digital literacy gap will continue to see industry and education entities expand new ways of earning qualifications and competencies for required skills.

The recommendations just discussed should help stakeholders in higher education and industry to better prepare postgraduates with the digital competencies required for future employment. Clearly, new models are needed that improve both educational and occupational outcomes to build a stronger talent pipeline for the future economy. Understanding the hurdles confronting our higher education learners and industry needs will require designing solutions that address effective collaborations and partnerships among educational institutions, industries, employers, policy makers, and government.

ACRL's Information Literacy Competency Standards for Higher Education
go.nmc.org/alainfolit

> Information literacy forms the basis for lifelong learning, in all disciplines, and for all learning backgrounds. The Association of College & Research Libraries (ACRL) provides a framework for assessing and developing information literacy pedagogical practices in postsecondary education. These standards and outcomes offer performance indicators for information fluency to support complex work environments and technological changes.

Common Sense Media: Copyright and Fair Use
go.nmc.org/commsense

> An educator animated video and discussion guide that provides an overview of copyright law and fair use for learners to consider how to appropriately use someone else's original work responsibly.

Data Information Literacy
go.nmc.org/datain

> The Institute of Museum and Library Services has partnered with researchers from Purdue University, the University of Minnesota, the University of Oregon, and Cornell University to develop and implement skill development for effective data management and curation to support the next generation of scholars as they develop data information literacy skills to apply to their research projects.

Digital Pedagogy Lab
go.nmc.org/digpedlab

> The Digital Pedagogy Lab offers new approaches to teaching with technology and professional development through hands-on institutes and workshops that investigate the implementation of creative, critical, and digital pedagogies for learning. This professional learning and development comes out of work from the *Hybrid Pedagogy* journal[45] and additionally offers other outreach including open online courses, a regular #digped Twitter chat, and sharing on this hashtag.

.future
go.nmc.org/dotfut

> This Gimlet Creative and Microsoft–sponsored podcast talks about technologies and industries that will impact the way we work and live. Issues include how technology impacts our health, cyber warfare, gamification, and more. Listen to the audio episodes, find resources in the show notes, and/or read the full transcripts.

Information Fluency Project
go.nmc.org/21cif

> The 21st Century Information Fluency Project (21CIF), launched by the Illinois Mathematics and Science Academy, was initiated to research and develop training in the field of online information literacy, specifically with regard to evaluating digital information consumption. This site offers challenges, tools, tips, and tutorials for understanding how to effectively search, retrieve, and evaluate news and information on the Internet.

IRL: Because Online Life Is Real Life

go.nmc.org/irlpod

> This Mozilla-sponsored podcast talks about what life is like on the web. These audio episodes have show notes, transcripts, and resources to inform us about our digital lives. There is information on data, privacy, security, and general awareness for how we use technology on the Internet.

Jisc Digital Capability Codesign Challenge Blog

go.nmc.org/digcapa

> This blog has a wealth of resources for helping build digital literacies, specifically with regard to leadership, pedagogy, and efficiencies. A number of digital skills and frameworks are provided that help map capabilities[46] for learners and professionals.

Open UBC: Open Education Accessibility Toolkit

go.nmc.org/openubc

> This OER Accessibility Toolkit offers suggestions for creating accessible content for educators; however, these universal design principles and resources can help learners consider how they develop media and digital materials for online use.

University of Birmingham: Digital Storytelling Course

go.nmc.org/futlearndigstory

> This four-week open online course co-created by the BBC Academy and Creative Skillset offers both theory and practice for producing meaningful stories and developing digital content (e.g., audio, video). It also provides suggestions for all aspects of production, including research, editing, structure, ethics, legalities, and practical techniques for camera, sound, and lighting.

University of Leeds: Developing Digital Skills Course

go.nmc.org/futlearnblend

> This four-week open online course will get you started on developing relevant digital skills for the workplace, such as forging a digital identity, creating digital content, publishing, and managing digital artifacts.

Wikimedia Foundation: What Is Creative Commons?

go.nmc.org/wikifoun

> This is a short video overview with related resources that explains and models how to share creative works using a Creative Commons license.

To meet the requirements of industry in the future, higher education institutions need to include digital literacy development within their undergraduate programs and consider further digital literacy training support. Industry needs coupled with technological changes are encouraging the employment and education sector to create further connections between learning and work. "Most college graduates regard their college experience as very useful for intellectual growth; views are more mixed when it comes to job opportunities and marketable skills."[47] There is a great desire by learners, educators, and industry leaders to have digital literacy experiences woven into the curriculum. Engaging learners with digital tools and developing technical skills has important implications for the workforce and society.

The findings and recommendations of this study offer insight into how digital literacy can be supported beyond higher education institutions to impact postgraduates in the workplace. There will be an increasing need for fluidity between education, training, and employment. Robots will not replace all human workers; however, we will experience a shift from a physical to a knowledge-based labor market. Work will require solving unstructured problems, working with new information, and having the ability to process and integrate multiple information sources, specifically to perform complex tasks, interpret meaning, and communicate value to others.

Although current educational pathways seem to be linear, the digital literacy and job skills of the future will require industry leaders and educators to partner to solve the labor market needs and encourage broader knowledge sharing. McKinsey Global Institute identified three ways digital platforms and other innovations will impact the future of work, specifically by creating new opportunities for workers, companies, and across industry sectors:[48]

1. *Digitization of assets, including infrastructure, connected machines, data, and data platforms;*
2. *Digitization of operations, including processes, payments and business models, and customer and supply chain interactions; and*
3. *Digitization of the workforce, including worker use of digital tools, digitally skilled workers, and new digital jobs and roles.*

Digital literacy development, as a whole, helps contribute to the knowledge society. Learners are able to interpret and make meaning of an abundance of information and navigate how they share data online. Digital literacy learning provides students with the foundational training required to gain agile technology skills, and it cultivates learners' continuous learning competencies, which will help learners navigate in a future career that may not exist yet. Higher education institutions have the responsibility to prepare postgraduates to adapt and apply learning to a variety of occupational environments. Postgraduates should leave with their degree and the confidence to engage fully in their professional roles by asking good questions, thinking critically, collaborating with others, and learning whatever is necessary. Higher education will need to recalibrate expectations and applications of what digital literacy development is and anticipate how these experiences and competencies will go to work after graduation.

NMC conducted an online survey among 35 colleges and universities, and one association, between April and June 2017 that yielded 727 completed surveys to use in this analysis. Data tables and statistical analysis documentation are included in the Appendix. A copy of the survey instrument can be requested at info@nmc.org. Three recent college graduates were also interviewed to inform the results of this study. Their insight, experiences, and feedback were used to contextualize survey results and reviewed literature.

Survey Data Tables

Table 1. *Employment by Industry*

Industry	Percent	Count
Education	17.4%	97
Medical/Health Services	9.7%	54
Technology	9.3%	52
Engineering	9.2%	51
Government	8.3%	46
Research	5.4%	30
Business & Consulting	5.2%	29
Marketing & Communications	4.8%	27
Nonprofit/Public Service	4.8%	27
Finance/Accounting	4.7%	26
Legal	3.4%	19
Food & Hospitality	3.1%	17
Transportation	2.3%	13
Construction/Utilities/Contracting	2.2%	12
Media Production (Film, TV, Radio)	2.2%	12
Insurance	2.0%	11
Agriculture & Forestry/Wildlife	1.8%	10
Real Estate & Housing	1.4%	8
Natural Resources/Environmental	0.9%	5
Motor Vehicle	0.7%	4
Writing/Editing (e.g., Journalism)	0.7%	4
Safety/Security	0.5%	3
Total	**100.0%**	**557**

Table 2. *Level of Undergraduate Training*

Undergraduate Training	No Training	Minimal Training	Moderate Training	Advanced Training	Total
Responsibly using technology and media with regard to laws, rights and responsibilities, and security	22.5%	35.6%	31.9%	10.1%	725
Conceptualizing, analyzing, and evaluating a subject or issue in order to inform an educated perspective	8.3%	17.0%	42.2%	32.4%	722
Using technology and digital environments to work with peers to collaboratively generate an idea, content, media, or product	9.0%	21.3%	43.2%	26.5%	722
Recognizing and breaking down complex challenges and then planning and applying solutions.	9.4%	21.6%	40.6%	28.3%	721
Using technology to generate and/or recognize ideas, content, or products that are imaginative and inventive	13.6%	28.6%	36.8%	21.1%	721
Applying your digital skills to new contexts and environments	15.5%	26.8%	37.3%	20.3%	723
Finding, interpreting, evaluating, managing, and sharing information across the web	9.0%	23.1%	40.0%	27.9%	723
Using technology to create artifacts that uniquely communicate ideas or stories	20.2%	30.9%	31.2%	17.6%	721
Producing media such as video, audio, or graphics	31.4%	32.0%	23.1%	13.6%	723
Producing content and assets for a range of digital formats, including for mobile delivery, mobile apps, podcasts, or ebooks	53.5%	25.9%	13.0%	7.6%	723
Using technology to store/showcase digital artifacts you created	31.1%	33.3%	23.1%	12.4%	723

Table 3. *Current Job Areas of Confidence*

Areas of Confidence	Very Insecure No knowledge	Insecure Minimal knowledge	Somewhat Confident Some knowledge	Confident Moderate knowledge	Very Confident Highly knowledge-able	Total
Responsibly using technology and media with regard to laws, rights and responsibilities, and security	5.6%	9.6%	23.5%	37.4%	23.9%	719
Conceptualizing, analyzing, and evaluating a subject or issue in order to inform an educated perspective	2.1%	5.7%	16.7%	40.8%	34.7%	718
Using technology and digital environments to work with peers to collaboratively generate an idea, content, media, or product	3.1%	6.4%	18.4%	37.1%	35.0%	717
Recognizing and breaking down complex challenges and then planning and applying solutions	3.1%	6.4%	18.4%	38.0%	34.1%	718
Using technology to generate and/or recognize ideas, content, or products that are imaginative and inventive	4.1%	9.8%	24.0%	36.3%	25.8%	716
Applying your digital skills to new contexts and environments	4.3%	9.3%	22.3%	35.0%	29.0%	717
Finding, interpreting, evaluating, managing, and sharing information across the web	3.4%	6.4%	17.6%	36.9%	35.8%	716
Using technology to create artifacts that uniquely communicate ideas or stories	7.8%	13.7%	29.5%	27.1%	21.9%	716
Producing media such as video, audio, or graphics	13.8%	21.4%	26.0%	20.9%	17.9%	716
Producing content and assets for a range of digital formats, including for mobile delivery, mobile apps, podcasts, or ebooks	25.9%	26.7%	18.9%	15.7%	12.9%	715
Using technology to store/showcase digital artifacts you created	10.9%	21.0%	25.0%	23.6%	19.4%	715

Table 4. *Digital Tool Undergraduate Experience*

Digital Tool Undergraduate Experience	No Experience	Minimal Experience	Moderate Experience	Advanced Experience	Total
Digital storytelling (e.g., producing media with a narrative voice, often combining video, images, and sound to tell a story)	38.3%	33.1%	18.4%	10.3%	711
Media production/editing (e.g., creating and editing video, audio, photos, or graphics)	37.6%	33.6%	19.5%	9.3%	711
Collaborating with peers on digital content creation	18.0%	31.9%	33.3%	16.9%	712
Website and app development	52.2%	27.3%	14.2%	6.3%	711
Social media content creation/sharing	31.7%	32.5%	23.8%	12.0%	710
Digital communications (e.g., creating slides, infographics, or other products that showcase the work across a project)	10.4%	23.4%	38.1%	28.1%	709
Problem-solving in digital environments (e.g., troubleshooting issues with digital content, such as a graphic not displaying properly)	28.4%	33.2%	24.1%	14.3%	711
Researching and curating web content (e.g., finding and sharing online articles, reports, and other forms of research)	14.1%	22.0%	33.0%	30.9%	709

Table 5. *Frequency of Work Activity Engagement*

Work Activities	Never	Rarely (Annually)	Sometimes (Monthly)	Often (Weekly)	Total
Digital storytelling (e.g., producing media with a narrative voice, often combining video, images, and sound to tell a story)	43.4%	25.7%	18.7%	12.2%	716
Media production/editing (e.g., creating and editing video, audio, photos, or graphics)	35.8%	27.8%	20.6%	15.8%	717
Collaborating with colleagues on digital content creation	19.2%	24.4%	28.5%	27.9%	713
Website and app development	54.8%	20.3%	14.0%	10.9%	715
Social media content creation/sharing	38.5%	24.4%	19.0%	18.1%	712
Digital communications (e.g., creating slides, infographics, or other products that showcase the work across a project)	16.5%	19.2%	32.9%	31.4%	714
Problem solving in digital environments (e.g., troubleshooting issues with digital content, such as a graphic not displaying properly)	23.9%	16.2%	27.0%	32.8%	714
Researching and curating web content (e.g., finding and sharing online articles, reports, and other forms of research)	18.5%	17.8%	28.4%	35.4%	715

Table 6. *Postgraduate Occupational Success*

Postgraduate Occupational Success	Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree	Total
I was prepared to do my work when starting my job.	6.5%	8.7%	15.3%	35.9%	33.7%	647
My job incorporates the digital literacy training I received as an undergraduate.	16.8%	13.0%	22.0%	27.2%	21.0%	644
I am able to do my job better because of the digital literacy training I received as an undergraduate.	17.2%	11.3%	24.7%	23.2%	23.6%	647
Since graduating, I have had to engage in regular training to get up to speed on the digital skills needed to excel at my job.	21.1%	17.9%	21.8%	22.7%	16.5%	648
I have received positive job performance evaluations regarding my digital skills.	7.9%	5.9%	28.4%	25.3%	32.6%	645
I have been recognized or rewarded at work for my digital skills.	15.8%	10.7%	32.0%	22.4%	19.2%	647
I have received a promotion within the last year.	29.9%	8.4%	28.8%	11.8%	21.1%	645
I earn comparable pay to similar professionals in my field.	10.7%	10.4%	26.2%	26.0%	26.7%	645
I feel more accomplished in my profession because of my digital literacy training as an undergraduate.	20.4%	14.8%	25.0%	24.0%	15.9%	643
I am satisfied with the progression/trajectory of my career because of my digital literacy training as an undergraduate.	16.6%	13.9%	33.0%	20.9%	15.6%	646

Table 7. *Correlations*

Variables	Undergraduate Training	Confidence in Ability	Level of Experience	Activity Engagement	Occupational Success
Undergraduate Training	1				
Confidence in Ability	.596[*]	1			
Level of Experience	.764[*]	.579[*]	1		
Activity Engagement	.370[*]	.545[*]	.447[*]	1	
Occupational Success	.608[*]	.583[*]	.590[*]	.492[*]	1

*Correlation is significant at the 0.01 level (two-tailed).

[1] https://www.nmc.org/news/nmc-releases-horizon-project-strategic-brief-on-digital-literacy/
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