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## Digital Literacies in the Classroom: Authentic Opportunities for Student Engagement

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# Handbook of Research on Fostering Student Engagement With Instructional Technology in Higher Education

Emtinan Alqurashi  
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# Chapter 7

## Digital Literacies in the Classroom: Authentic Opportunities for Student Engagement

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### ABSTRACT

*In efforts to improve students' digital literacies on a STEM-focused campus, one university created a digital literacies initiative to support both faculty and students. Faculty development programming supported the development of assignment parameters, detailed assessment rubrics, and scaffolding activities. A campus tutoring center was piloted to support students' acquisition of digital literacies. This chapter offers examples from three faculty members who participated in the digital literacies initiative and implemented digital literacy assignments in their courses. The researchers offer best practices for campuses interested in developing digital literacy initiatives.*

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## ***Digital Literacies in the Classroom***

### **INTRODUCTION**

Improving digital literacies is described as a significant challenge for 21st century colleges and universities by the New Media Consortium in their *2016 Horizon Report*. Today's students grow up engaging with technologies, social media, and other digital environments, but they often lack digital skills seen as important in the contemporary workforce (Oblinger & Oblinger, 2005; Jones & Cross, 2009; Brumberger, 2011). While students may be adept as consumers and users of digital technologies, they continue to need critical digital literacy skills to be persuasive, responsible 21<sup>st</sup> century technologists (Selber, 2004). Recent research also suggests that students are not receiving the support they need to develop these skills (Parr, 2015).

Students also often struggle with understanding how to apply conceptual information learned in the classroom to "real-world" situations. Providing students with authentic assignments, in which students have opportunities to engage in hands-on, process-based tasks, is an effective way to help students apply conceptual knowledge. Additionally, as students entering the workforce are increasingly expected to have the skills necessary to produce digital deliverables, authentic digital assignments are an effective way to allow students to develop content knowledge while also developing foundational digital literacies.

However, because of the rapidly changing nature of digital technology, the skills, competencies, and practices that students develop in order to become digitally literate are continually evolving. In 2002, The U.S. Educational Testing Service identified "five components [of digital literacy that] represent a continuum of skills and knowledge," and these skills are scaffolded in order of "increasing cognitive complexity": accessing information, managing information, integrating information, evaluating information, and creating information (as cited in Martin, 2008, p. 158). Several years later, the ITU Monitor (2006), a longitudinal survey that assesses the use of information and communications technologies for pedagogical purposes, identified three digital competencies for students: "accessing information," "integrating information," and creating rhetorically effective digital texts (as cited in Sjøby, 2008, p. 140). Bawden (2008) identified six central competencies associated with digital literacy: "reading and understanding digital and non-digital formats," "creating and communicating digital information," evaluating information, "knowledge assembling," "information literacy," and "media literacy" (2008, p. 29). In light of these overlapping yet still distinct descriptions of digital literacy, researchers, like Martin (2008), conceive of digital literacy as multilayered, relying not only on traditional alphabetical literacy, but also technological literacy, information literacy, media literacy, visual literacy, and communication literacy (p. 158-62).

Several benefits stemming from digital literacy indicate the need for instructors to support students in developing these skills. For example, students with underdeveloped digital literacies are at a disadvantage, as "limited knowledge of basic digital literacy skills inhibits success in higher education [and is] essential to meaningful, empowering communication in the 21<sup>st</sup> century" (Bancroft, 2016, p. 46). Additionally, Barak (2018) observed that digitally literate students were more likely to be flexible and open to change, with students who were digitally literate and preferred to work collaboratively were found to be most flexible (p. 121). The links between student success and digital literacy further demonstrate the benefits of incorporating digital assignments in higher education classrooms.

Instructors observe a need not only to develop their own digital literacies but also to incorporate digital assignments in the classroom. However, many instructors are hesitant to do so for a variety of reasons, including a lack of familiarity with the digital tools needed to complete the assignment, uncertainty about how to evaluate the assignment, or a lack of time in the classroom to instruct students in how to

## ***Digital Literacies in the Classroom***

use the necessary digital tools. Thus, digital design studios and multiliteracy centers can supplement instructor support by offering a range of digital literacy support, helping students to build functional, as well as critical, digital literacies.

Building these essential digital literacy skills in the classroom requires effective pedagogical decision-making. In her review of digital literacy support for students in higher education contexts, Bancroft (2016) concluded that “learners best retain and apply [digital literacy] skills if taught in meaningful contexts with personalized support” and that “face-to-face, one-on-one tutoring is typically the most effective means of transfer” (p. 50)<sup>1</sup>. However, as the concept of digital literacies is multilayered and involves various other literacies, scholarship in this area often focuses on best practices for teaching particular types of digital literacy. For example, Neumann (2016) noted the importance of information literacy for first-year students and identified assignments that encourage critical thinking and navigating library or other resources to locate scholarly articles as best practices for encouraging the development of information literacy, while Matrix, Hodson, and Hodson (2014) noted the importance of visual literacy in the development of digital literacy, identifying infographic assignments as a way for students to develop skills in research (information literacy), design (visual literacy), and “technical fluency” (technological literacy), all of which contributed to students’ development of digital literacies (para. 10). The research regarding instructors incorporating digital literacies indicated positive outcomes, yet the nebulous concept of digital literacy means that its incorporation must be contextually situated and that additional research is required to develop educational best practices.

Thus, in an effort to continue the argument for the importance of digital literacies and authentic learning experiences, and to identify some best practices for the inclusion of digital assignments in higher education, this chapter documents how a Digital Literacies Initiative, involving the creation of a Digital Studio on a STEM-focused campus, created authentic opportunities for student engagement while allowing students to practice and develop various components of digital literacy. The researchers provide a review of digital literacy scholarship and relevant research on authentic student engagement and offer the following examples of how faculty can create digital assignments as authentic student engagement opportunities for students:

- Conducting Authentic Genre and Audience Analysis in Technical Report Writing
- Making Authentic Connections through Social Justice Podcasts
- Communicating STEM Content in Authentic Ways

The chapter concludes with a discussion of best practices for faculty development and implementation.

## **BACKGROUND**

### **The Need for Digital Literacies**

The researchers’ institution is a private university specializing in aviation and aerospace, offering degrees in four colleges: aviation, business, engineering, and arts and sciences. Students arrive on campus with strong technical backgrounds; however, these skills fall short when using technologies to communicate professionally. Results from a 2016 campus survey of faculty (n=187) suggest that more support for students’ digital literacies is needed:

### **Digital Literacies in the Classroom**

- Only 50% of campus faculty believe students are literate at using digital tools productively.
- Only 38% of campus faculty believe students are literate at digital communication.
- Only 36% of campus faculty believe students are literate at digital media production.

Many students continue to struggle to develop digital artifacts such as technical reports, websites, infographics, podcasts, short instructional films, and research posters. Simply mastering STEM content is not enough when students enter the workforce; faculty recognize that *communicating* STEM content is an important outcome not yet being achieved by many students.

The Digital Literacies Initiative at the researchers' institution was created in response to these concerns. Faculty also acknowledged that they themselves did not necessarily have the digital skills to teach students, but instead would need support from digital experts. Compounding these skill gaps is a digital divide. This concept describes the benefits afforded to students from economic and social backgrounds who have had more access to digital technologies and additional opportunities to develop digital literacy skills; simultaneously, the digital divide penalizes those who have grown up in less technologically-rich environments (Neuman & Celano, 2006).

To address these skills and equity gaps, the campus' Task Force on Innovation, a community of faculty, staff, and administrators on campus, created the Digital Literacies Initiative in 2014. The initiative focused on two aspects of digital literacy development: faculty development and student support. The campus' Center for Teaching and Learning Excellence (CTLE) offered faculty development workshops and one-on-one consultations to help faculty to produce effective assignment sheets, detailed rubrics, and lesson plans for in-class scaffolding. To support both students and faculty, the campus created a companion Digital Studio, a tutoring space designed to provide equitable access to digital technologies, supplemental instruction of digital literacy skills, and opportunities for students to engage in authentic production of digital artifacts as a part of their coursework for faculty.

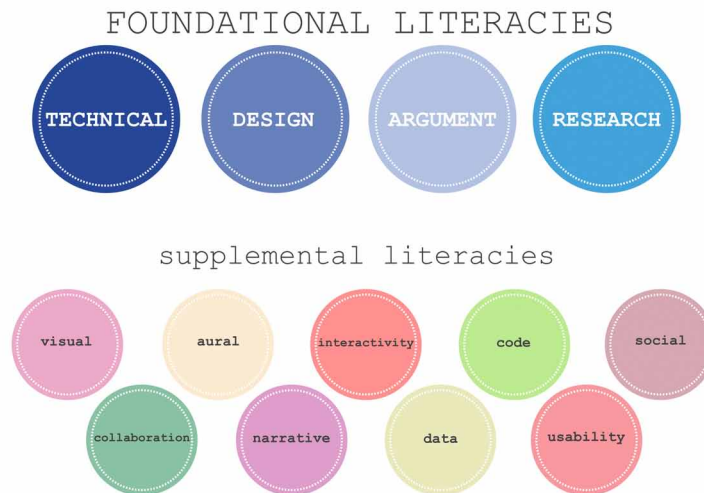
### **Faculty Development and Digital Studio Support**

In 2015, CTLE worked with 7 pilot faculty from across disciplines to develop digital literacy assignments. At a half-day workshop, faculty were introduced to a digital literacies model adapted from the University of Southern California's Institute for Multimedia Literacy project (<https://cinema.usc.edu/iml/resources/handbooks/studenthandbook.cfm>).

The adapted model highlighted both foundational literacies (digital, network, design, argumentation, and research) and supplemental literacies (presentation, visual, sonic, interpretation, annotation, collaboration, narrative, pedagogical, interactivity, and code). Faculty were then introduced to a variety of digital genres that provide opportunities for digital literacy development, including slideshows, podcasts, posters, infographics, movies, and screencasts. In following semesters, faculty developers worked closely with faculty to create assignment sheets, rubrics, assessment measures, and models to be used in classroom delivery. An additional 13 faculty participated in the Digital Literacies Initiative in the following semester, producing a range of digital literacy assignments, rubrics, and scaffolding activities for students. All campus faculty were offered an opportunity to participate in the grant and self-selected into the program. Faculty participants were drawn from each of our 4 colleges and ranged in rank from instructor to full professor. Some of the departments represented in these first two cohorts were Applied Aviation Sciences, Engineering Fundamentals, Humanities/Communication, Mathematics, Management/Marketing/Operations, Physical Sciences, and Security Studies and International Affairs.

## Digital Literacies in the Classroom

Figure 1. Adapted digital literacies model



To understand faculty perceptions of the value of CTLE's Digital Literacy Workshop, CTLE collected data in an online survey from the 20 faculty from both Fall 2015 and Spring 2016 semesters. The survey was provided to workshop attendees immediately after the Digital Literacy Workshop and asked 5 questions about the value and usefulness of the workshop and its materials. They were also provided with an open-ended question asking them to offer advice for future workshops and faculty development support. When asked to what extent faculty found the workshop and its materials valuable, 100% of faculty found them valuable (18/20 responded).

To support students outside of the classroom, the Digital Studio was established as a tutoring center. An initial budget of \$50,000 was spent on hardware and software needed, minimal cosmetic changes to a renovated classroom, and student tutor wages. The Digital Studio has always been staffed by undergraduate student tutors with a range of expertise in radio/audio production, graphic design, web design, photography, and movie-making. The Studio initially employed 9 tutors, most of whom were first-year students.

Tutors were trained in two capacities: technologies and consultation skills. Tutors were asked to complete faculty-generated digital assignments themselves, so they could better understand faculty expectations, as well as to produce content for a Digital Studio website. Tutors with more digital experience mentored less experienced tutors in a shadowing program. In addition to the technology training, tutors also received training on professionalism, interpersonal communication, and consulting techniques to prepare them for their work with students.

Tutoring was offered to all students enrolled in courses taught by faculty participating in the Digital Literacies Initiative. Some faculty chose to require tutoring as a part of the classroom assignment, while others decided to make tutoring from the Digital Studio optional. Digital Studio tutors worked with students on a variety of digital projects, including scientific research posters, infographics, instructional and creative videos, podcasts, brochures, pamphlets, websites and slideshow presentations. In each of these project formats, students had opportunities to develop both content knowledge and digital literacies.

### **Digital Literacies in the Classroom**

To gauge the success of the Digital Studio from the perspective of these student visitors, tutors collected survey data from 502 students (74% return rate) using an online survey tool. Students were asked to rate their session, whether they would return for tutoring, whether they would recommend the Digital Studio to a friend, and to what extent the tutor helped them achieve their goals for the assignment. The results suggest that the Studio is a valuable resource for students who need support for their digital literacy development. While fewer than 25% of students actually took advantage of the Digital Studio, students recognized the value once they had an appointment with a tutor. 93% of student visitors rated their sessions as “excellent” or “very good,” and 90% would return to the Digital Studio in the future. An even higher percentage of those surveyed would recommend the Digital Studio to others (95%). When asked to what extent the tutors helped students achieve their goals for the session, 89% selected “very much.”

In addition to assessing the value of the tutoring experience in the Studio, CTLE also assessed the extent to which students valued the digital assignment as a learning tool within their courses. In the first year, sixty-three (63) students completed an end-of-course survey distributed by Institutional Research (27% return rate). When asked to what extent their digital literacy skills improved, 81% of students claimed their digital literacy skills had improved as a result of the project. Sixty-nine (69)% of students claimed the digital assignment contributed to their learning in the class.

Since 2015, the Digital Studio has opened its doors to all campus students. The Studio’s tutors have served well over 1,500 students, and over 30 faculty have worked with CTLE and the Digital Studio to develop authentic digital literacy assignments and associated pedagogical materials. Faculty not only have created new assignments through their work with CTLE and the Digital Studio, but also have revised existing materials to create more authentic assignments intended to develop students’ content knowledge and digital literacies. Each of the case studies presented below focuses on the process of revising an existing assignment with a traditional deliverable to provide more authentic opportunities for student engagement.

## **AUTHENTIC ENGAGEMENT THROUGH DIGITAL LITERACIES**

The implementation of digital projects provides faculty across the disciplines with authentic opportunities for student engagement. Authenticity can be framed as an attribute both of pedagogical tasks and pedagogical materials (Johnson, 2016; Eyler, 2018). Authentic pedagogical tasks are the genuine processes in which students engage with the content of the course. As one example, research scientists in the workforce design their research methodologies, conduct research, analyze their results, and develop technical reports, posters, and other digital genres in order to communicate their STEM content to a variety of audiences, from laypersons to experts in their respective fields. An instructor who creates an authentic pedagogical task would seek to engage students in the processes of *design*, *analysis*, and *technical communication*. The purpose of creating authentic pedagogical tasks for students is to replicate, in significant ways, the authentic professional environments that students will encounter upon entering the workforce.

When framing authenticity as an attribute of pedagogical materials, learning materials and the content of a course are drawn from the real world, as opposed to those materials created and delivered in a format prepared specifically for a particular student demographic (Johnson, 2016). For many of the digital assignments created under the Digital Literacies Initiative, faculty rely on these real-world materials to persuade students of their currency in their respective fields. When teaching the genre of

## ***Digital Literacies in the Classroom***

technical lab reports, for example, instructors can draw on authentic examples of lab reports to illustrate the genre, determine generic conventions, and model productively for students how genres function in disciplinary communities.

In an exploration of authenticity, Eyler explains that “learning is embedded in a domain-specific context” (2018). For students, whether they are flying a simulator or jet hardly matters, as long as the brain registers the experience as being “real.” His example of a student flying in a “simulator or jet” is particularly apt, given the domain-specific context in which the students at the researchers’ campus operate. It is worth considering what is meant by real, however. While the goal of an authentic pedagogical activity is to simulate reality, a certain amount of “cognitive authenticity” is needed for the suspension of disbelief necessary to fully realize that reality and engage students in deep learning.

Digital literacies projects are immersive, often collaborative, and engage students in the production of authentic digital artifacts that often will be a part of their working lives after graduation. Perhaps their greatest benefit is that these projects are diametrically opposed to the inauthentic experience of sitting through a lecture, which as Eyler points out, has long been found “to be ineffective means for engendering student learning” (2019). He goes on to argue his belief that this is primarily because of the lecture’s inauthenticity as a pedagogical task. Instead, digital literacies projects are often complex, audience-centered activities that require students to engage deeply in a number of higher-order learning tasks to be successful.

Authenticity, therefore, can be thought of as a continuum. A more authentic task would be work done in a real environment, with a specific audience, and operating within a context in which the result of the work has implications for the student beyond a grade on an assignment. As this pure level of authenticity is only sometimes somewhat achievable through an educational context, educators must instead rely on creating opportunities for cognitive authenticity as they plan learning experiences for students.

What authentic pedagogical tasks and materials can be leveraged in the classroom to fully engage students in deep learning? Researchers have identified ten characteristics of authentic activities (Herrington et al, 2002):

1. Real-world relevance
2. Ill-defined parameters
3. Complexity
4. Allow for multiple perspectives
5. Opportunities for collaboration
6. Opportunities for reflection
7. Cross-disciplinary
8. Real-world assessment
9. Create polished products
10. Allow for diversity of outcomes

Digital literacies afford instructors opportunities to engage students in authentic activities that encompass many combinations of these characteristics, as the examples below will show. The following faculty assignments employ a number of Lombardi’s criteria for authentic learning and serve as exemplars for instructors who seek to engage students using digital literacies.

## *Digital Literacies in the Classroom*

# **CONDUCTING AUTHENTIC GENRE AND AUDIENCE ANALYSIS IN TECHNICAL REPORT WRITING**

## **Assignment Development**

In Spring 2018, Alex Watkins designed an assignment for Technical Report Writing intended to make students familiar with some fundamentals of website design, design principles and their role in technical communication, and the genre of technical reports. Through the Digital Literacies Initiative, Watkins redesigned an existing white paper genre analysis assignment to incorporate a website deliverable with a heavier focus on data visualization. The basic assignment concept asked students to analyze technical reports in their field to produce more effective technical reports later in the semester.

In the redesigned assignment, student groups analyzed technical reports in their shared discipline over four weeks in Spring 2018, and three weeks in Fall 2018. During this period, students developed team goals, created internal group schedules, and were provided class time to collaborate to create the final deliverable. Watkins provided minimal intervention in the form of lecture or structured classroom activities, but did provide resources in the form of readings, rubrics, and samples that students could use to create their own sites. Instruction primarily consisted of answering questions and individual group conferences. The goal was to mimic the fluidity and flexibility of the independent, collaborative, problem-based environment that many of the students in the STEM disciplines will face in their future.

## **Faculty Development Support**

CTLE and the Digital Studio Director designed the Digital Literacies Initiative with a focus on practicality and building a community of instructors who value digital literacies. The group discussed several best practices and resources for designing and assessing digital deliverables in the first meeting to guide the redesign and received feedback on the redesigned assignment from a Digital Studio student tutor. The feedback from the tutor was invaluable regarding scheduling and clarity of assignment parameters. During the second meeting, initiative participants shared their redesigned projects and provided feedback on the assignment. This collaboration and feedback allowed for a practical, practicable assignment in the classroom.

## **Role of Authenticity**

Students began by planning their group's collaboration. Subsequently, students used the school library resources to identify technical reports in their fields and received some guidance regarding how to analyze the reports for audience, author credibility, purpose, content, writing style, and document design. The groups then developed a website to present their findings to students in their major. The goal of the assignment was to establish students' understanding of the genre of technical report writing, improve and encourage effective collaboration, demonstrate the importance of understanding genre and its influence on audience expectations, and develop students' knowledge of effective design principles and use of data visualization. The assignment was consistent with several of the hallmarks of authentic assignments as defined by Herrington et al. (2002) namely:

### **Digital Literacies in the Classroom**

- Students investigated the genre of technical reports in their discipline as the first education on the technical report provided in the class to encourage *complex* and *reflective* engagement without instructional framing
- Parameters for the assignment were *flexible*, within some minor guidance regarding genre analysis
- Students planned and participated in productive, self-directed *collaborations*, which helped them engage with the genre more thoroughly and find authentic relevance in their task
- Using what-you-see-is-what-you-get (WYSIWYG) editors, students developed *polished deliverables* of real-world examples of technical reports in their discipline.

The goal of incorporating the authentic assignment was to mimic workplaces. When introducing the project, Watkins provided basic instructions, but indicated that in the business environment, employers would be unlikely to provide exact and specific directions for each individual task. The example used in class was that students, as future employees, might be asked to conduct research and deliver a report on their findings to their boss or colleagues. Therefore, the authentic assignment gave transferable planning and collaboration skills that students can employ in their future projects.

### **Digital Studio Support**

The Digital Studio was a vital component of students' success in the website project. Because the parameters were deliberately vague and students had the opportunity to make their own schedules, some students incorporated Digital Studio meetings into their schedule. Watkins encouraged students to seek out assistance from the Digital Studio so that they could receive necessary support for working with the digital tools and developing digital literacies in an interactive, one-on-one setting, in line with best practices in the research (Bancroft, 2016). A small amount of extra credit was provided for one meeting; however, many students chose to return to the Digital Studio for multiple appointments during the project.

Students who attended the Digital Studio performed significantly better on the final website than those who did not, even without the extra credit opportunity. Those students who took advantage of the opportunity included more interactive elements, produced more sophisticated data visualizations, and generally had a better understanding of the website genre. According to Watkins, students often reported back about their authentic conversations about digital products, best practices, and future applications of the skills they learned in the Digital Studio. Of those who did not attend the Digital Studio, some groups turned in text-heavy or unpolished deliverables, while these issues were not present in the student groups that engaged with Digital Studio tutors.

Based on student evaluations, most students valued their experiences in the Digital Studio and would use the services again. For both semesters, only approximately 6% of students indicated that they would not use the Digital Studio again (6.25% in Spring 2018, and 6.35% in Fall 2018). Seeing the value of the Digital Studio in Spring 2018, Watkins strongly encouraged Digital Studio attendance in Fall 2018, and the percentage of students who did not attend the Digital Studio dropped from 31.25% in Spring 2018 to 17.46% in Fall 2018, which correlated with overall higher grades on the website project in Fall 2018 on document design scores. Further, 45.35% of students in Spring 2018 indicated they strongly agreed or agreed that the Digital Studio improved their projects, whereas 52.38% of students in Fall 2018 indicated the same improvements.



## ***Digital Literacies in the Classroom***

### **Assessment of Digital Literacies**

Supporting authentic engagement through website development has been the most successful component of the project. In their end-of-course evaluations, students cited the importance of digital projects and their digital competencies in the future:

- “The world is going digital, so should the classroom. I think it’s a very good tool to learn.
- “These type of assignments are what we will be completing in our future jobs, so its [sic] helpful in preparing us for our future tasks.”

These responses showed that students understood the relevance and real-world applications of their burgeoning digital literacies. Further, as indicated in *Figure 2*, approximately 84% of students in Spring 2018 and 83% of students in Fall 2018 felt that they had improved their digital literacy as a result of the assignment.

In addition, most students felt as if the integration of the website project improved their learning in the course (70.29% in Spring 2018; 73.01% in Fall 2018).

The more challenging component of establishing authenticity is achieved when students value the digital deliverable they created and grasp the importance of the genre analysis component of the writing process. As indicated above, while the overall perception of the project is positive, the website project is also the most commonly cited issue in response to the student evaluation question: “What elements in the course LEAST helped you learn the course content?” Students responded relatively infrequently to this question, but of those students who did respond (Spring 2018,  $n = 35$ , 54.7%; Fall 2018,  $n = 34$ , 53.1%), approximately 25% ( $n = 17$ ) indicated that the website was least helpful. Student comments tended to include three primary critiques:

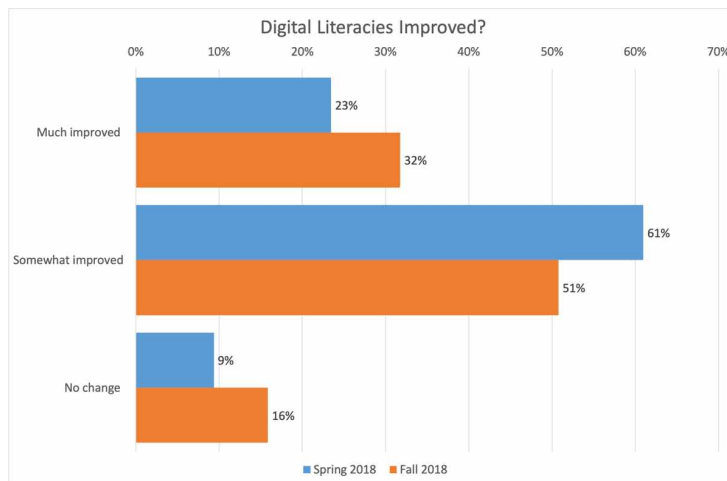
- Devaluing the analysis and analytical products developed through the website compared with direct instruction (e.g., “The website assignment was not beneficial (sic) at all. I appreciate how the professor was thrilled to add an engineering based assignment to the course, but I do not think it was effective for my group members nor I. I wish we could have used that time to start our reports.”)
- Focusing on design, rather than developing content knowledge (e.g., “I” personally did not get much from the website assignment. It was good to understand what tech reports consist of, but I feel like we focused more on just creating a good looking website.”)
- Developing limited knowledge because of unequal or ineffective collaboration practices (e.g., “The group website. I only focused on my part, which hindered my ability to evaluate overall key components of tech reports in my field.”)

Overall, much of the critique seemed to stem from students’ discomfort with relying on the knowledge that they produced during the project and potential discomfort with more fluid, less directive assignments. Additional opportunities to engage in authentic learning might develop these competencies and confidence to allow students to rely on their self-generated knowledge.

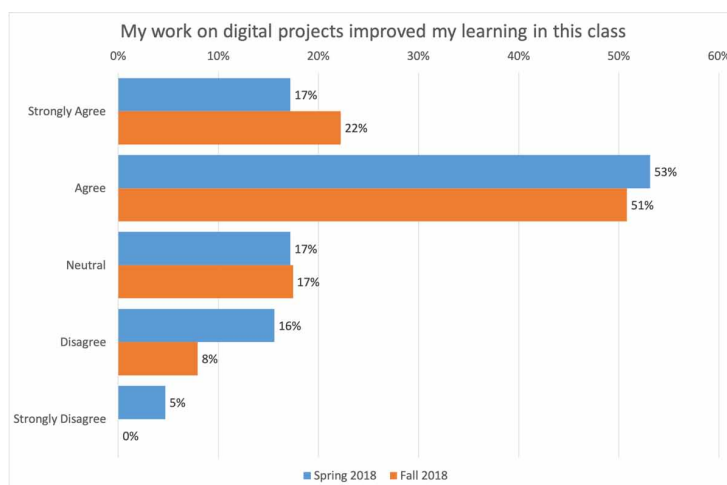
Despite the critique from some students, Watkins noted a significant improvement in genre awareness for technical reports. In previous semesters, students turned in final reports that had significant genre issues—namely, not relying on data, making an argument rather than analyzing, and devaluing

**Digital Literacies in the Classroom**

*Figure 2. Student perception of digital literacy skill improvement*



*Figure 3. Student perception of improved learning*



the importance of data visualization and document design. After the website project, some students still struggled with data and citation, but the number of students who simply did not include data visualizations, despite assignment requirements, significantly dropped. Moreover, students were less likely to rely on a set template for document design (i.e., APA); instead, they made decisions in accordance with the principles of design introduced in the website project. Therefore, although students had discomfort with the authentic assignment hallmarks, students did have significant progress in developing the three cornerstones of digital literacy indicated by Matrix, Hodson, and Hodson (2014), developing information literacy through genre analysis, visual literacy by making informed decisions about design and data visualization, and technical fluency through interacting with website editing software. Each of these skills contributed to students’ development of digital literacies, as evidenced by their final deliverables.

## *Digital Literacies in the Classroom*

# **MAKING AUTHENTIC CONNECTIONS THROUGH SOCIAL JUSTICE PODCASTS**

## **Assignment Development**

Aaron Clevenger sought to redesign an assignment in a first-year honors seminar on social justice and social change. Clevenger initially asked students to research a social justice topic and create a social media campaign that included a call to action. While the purpose of the course was to teach social justice and social change, students focused on the marketing aspect of social media rather than on utilizing social media platforms as a tool to educate others on social justice topics. An end of course survey confirmed that more than 50% of the students found the assignment and the course to be more about building a social media campaign than social justice. In response to students' comments, Clevenger joined the Digital Literacies Initiative to redesign the social change campaign to be a more authentic assignment. As a result of participation in this program, Clevenger developed a digital assignment asking students to design a podcast series. The assignment was redesigned to allow students to create a digital literacies artifact that combined social justice content with the use of the digital tools through which students could comprehend the real-world relevance of the project. This new digital literacy assignment facilitated learning from factual to metacognitive levels by engaging students in studying a social justice topic of their choice.

Students noted that the design of the social media campaign lacked authentic context and required learning outcomes to be discussed in more detail. Lombardi (2007) explained why this behavior occurs when warning that, in an absence of authentic context, learners will either reject new knowledge or will revert to using the knowledge in a familiar way: "Learners look for connections. When we approach a subject for the first time, we immediately try to perceive the relevance of the new concept to our lived experience. When a new piece of information simply doesn't fit in any of our existing knowledge structures (or "schemas"), it is often rejected. This means that the more encouragement a learner has to become invested in material on a personal level, the easier it will be to assimilate the unfamiliar" (Lombardi, 2007, p. 8). To help students make authentic connections to the project, Clevenger developed several scaffolding opportunities. Students were assigned to review Anderson's (2011) work and were prompted to reflect on how storytelling in a manner such as podcasting might have an authentic relevance to their future. In addition, Smith's (2012) foreword to Baillie, Pawley, and Riley (2012) was used as a resource for a course discussion on the importance of social justice in the field of engineering, especially in consideration of engineering's impact on the environmental, societal, and political outcomes of a region and its influence on the economy.

## **Literature Review and PowerPoint Presentation**

During the last few weeks of the course, students were assigned a literature review and an annotated bibliography on one of 24 social justice topics, including poverty, water usage, genocide, the impact of war, and climate change, among others. Upon the completion of the literature review, the class was divided into groups of three. Each group chose one group member's literature review to use as the basis for a 20-minute presentation on the chosen social justice topic. The presentation included the following:

- A brief synopsis of the social justice topic, including a definition (e.g., homelessness)
- A definition of important terms

## **Digital Literacies in the Classroom**

- Identification of any subcategories of problems--What are they, and how are they distinguishable? (e.g., in homelessness, there is episodic homelessness, short-term homelessness, and long-term homelessness; in addition, there are issues related to homelessness in children)
- Documentation of the injustices that have and/or are occurring related to this topic (e.g., lack of education for the homeless, lack of jobs, mental illness, lack of health care etc.)
- Proof that this is a problem (statistics, research, mentions in popular media)
- A brief history of the topic including what experts believe is the root cause of this issue, both historically and in present day
- An explanation of ways that society has dealt with the topic (i.e. homeless shelters, work programs, laws against the homeless, etc.)
- Consequences and impacts the social injustice has on individuals and society as a whole

### **Storyboarding and Scripting**

The 20-minute presentation was then used as a basis for the next portion of the assignment: the storyboarding and outlining of three different scripts for each of the three assigned podcasts.

Podcast 1: Student groups reconstructed their 20-minute research slideshow presentation into an 8-10 minute podcast, providing background, context, and facts about their social justice topic.

Podcast 2: In a second podcast of the same length, groups continued their conversation about their social justice topic. Within the second podcast, groups focused on changes needed to fight the social injustice. Students utilized concepts from Sensoy & DiAngelo's (2007) textbook *Is Everyone Really Equal* to inform possible social justice concerns and issues that must be addressed in order to achieve social change.

Podcast 3: In the final 8-10 min podcast, groups concluded their series with a positive story about change in action. As an example, if homelessness was the topic, a group identified and discussed a successful soup kitchen or a town's anti-poverty program. Groups were required to interview someone live on their podcast (allowing each team member to ask questions).

Students were given several class periods to storyboard (design the layout). Students were also encouraged to become familiar enough about their chosen social justice topic that they could speak conversationally within the podcast; this speaking style would provide smoother transitions among the three group members while also meeting the assignment parameters.

### **Faculty Development Support**

CTLE provided Clevenger and other pilot faculty with Mishra and Koehler's (2006) TPCK framework to facilitate student engagement with the content of the course, the digital technologies in use, and the development of digital literacies. Technological pedagogical content knowledge (TPCK) is an emergent form of knowledge that goes beyond all three components (content, pedagogy, and technology). This knowledge is different from disciplinary knowledge and general pedagogical knowledge shared by teachers across disciplines. Mishra and Koehler explain that the TPCK model "is the basis of good teaching with technology and requires an understanding of the representation of concepts using technologies; pedagogical techniques that use technologies in constructive ways to teach content; knowledge of what makes concepts difficult or easy to learn and how technology can help redress some of the problems that students face; knowledge of students' prior knowledge and theories of epistemology; and knowledge

### Digital Literacies in the Classroom

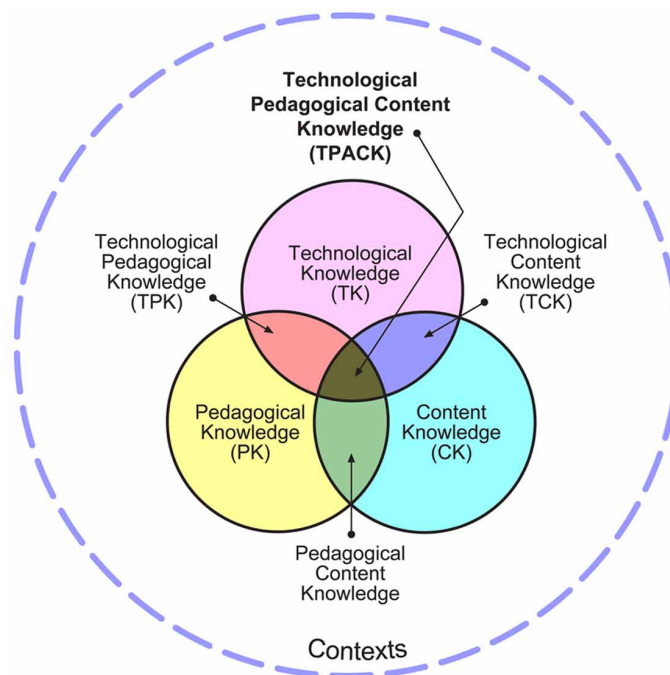
of how technologies can be used to build on existing knowledge and to develop new epistemologies or strengthen old ones” (2006, pp. 1028-29). To these ends, Clevenger was able to consider the intersected learning that should occur when designing an assignment to give equal weight to pedagogical content, and technological knowledge (See *Figure 4*).

### Digital Studio Support

Students were provided time out of the classroom to visit the Digital Studio for digital literacies development. Tutors aided students in transforming their storyboards into a podcast. Assignment instructions required that the final podcast include a musical opening, as well as an introduction of the presenters, the course, and the social justice topic. Further, the assignment required a voice-recorded monologue of all three group participants, vocal and musical segues between points, and both introductory and closing remarks.

Utilizing scripted storyboards, voice recordings, and copyright free or fair use music samples, the students, with the assistance of the Digital Studio tutors, mixed the audio together to form a final podcast. Each group was given the autonomy to use the recording hardware and software of their choice, though groups used either Audacity or Garage Band to produce their .mp3 or .mp4 audio file. One example of a final product by Bulger, Gain, & Spolar (2015) can be found at (<https://commons.erau.edu/db-honors-social-justice/1/>).

*Figure 4. Reproduced by permission of the publisher, © 2012 by tpack.org (Koehler, 2017)*



**Digital Literacies in the Classroom****Assessment**

Over the course of the three podcasts, the students developed competencies that allowed them to rely less on the Digital Studio than when they began the class. When comparing the social media assignment and the social change podcast assignment, the course developer noted tremendous improvement in the students' social justice and social change awareness, as indicated in Table 1:

In Clevenger's case, a digital literacies assignment was implemented to solve a pedagogical problem and did so through multilayering digital literacy opportunities as Martin (2008) describes. In one assignment, Clevenger asks students to develop a number of digital literacies: technological literacy, information literacy, and aural literacy. To support these efforts, the professor worked on improving scaffolding efforts, making more clear the assignment instructions and detailed rubrics, which helped shift the focus from student engagement with technologies for their own sake, to the ways in which technologies facilitate activist opportunities for social justice. Combining several of Lombardi's characteristics of authentic learning (real-world relevance, complexity, opportunities for collaboration, and create polished products), Clevenger's podcast series proved successful in helping students to make connections in authentic ways and contributed to improvements in student engagement.

**COMMUNICATING STEM CONTENT IN AUTHENTIC WAYS****Assignment Descriptions**

Emily Faulconer included digital literacies into a lecture and laboratory for General Chemistry I. In the lecture, Faulconer designed a project, "Chemistry in the Real World," which asked students to work individually on a project connecting their learning in the course to real-world chemistry. The overarching goal was to cultivate interest in science that would continue beyond the course. In addition, the assignment

*Table 1. Survey result comparison*

	<b>Social Media Campaign (n=12)</b>	<b>Digital Literacies Podcast (n=16)</b>
<b>Describe the main purpose of the assignment.</b>		
To teach the basics of a social media campaign/podcast	50%	0%
To introduce the basic concepts of social justice	25%	28%
To teach about the specific social justice topic studied	25%	71%
<b>How aware were you of the social change process regarding your social justice topic?</b>		
Somewhat aware	33%	14%
Aware	33%	29%
Extremely aware	33%	52%
<b>How aware were you of the importance of your social justice topic having a real-world impact?</b>		
Somewhat aware	17%	0%
Aware	33%	28%
Extremely aware	50%	71%

### **Digital Literacies in the Classroom**

supported the following key skills: 1) to bridge concepts to applications, 2) to communicate scientific content accurately for lay or peer audiences, 3) to appreciate the socially, ethically, and environmentally responsible use of chemical knowledge, and 4) to make decisions based on scientific information.

The deliverables for “Chemistry in the Real World” included the development of a project description, key vocabulary, clear connections to the learning objectives, and references. However, the activities and deliverables for the project were student-designed. Some instructor suggestions were to attend scientific talks, to reflect on current events, to critique a recent journal article, to conduct an interview, and to participate in chemistry-related volunteer work (like water quality monitoring). Students could also propose their own project. Common deliverables designed by the students were journal reflections, videos, podcasts, narrated slides, and infographics. A standard research report, in this case, was not a permissible deliverable.

In Faulconer’s laboratory course, the standard formal laboratory report was modified to reflect authentic scientific writing and publishing. Students collaborated in teams of two, with one student serving as the Principal Investigator, responsible for quality control and submission of the work. While a standard laboratory report typically includes materials, methods, results, and discussion, this deliverable was modified to reflect a scientific manuscript, including a literature review and works cited with at least 10 scholarly resources. Students were expected to properly evaluate sources for reliability, author credibility, and currency.

To enhance collaboration, provide a variety of perspectives, arrive at a polished final product, and further align with the authentic scientific process, students submitted their work for open peer review through the learning management system. This rough draft was worth 5% of their course grade. The final draft of the formal report, submitted online, was worth 10% of their overall course grade, with their grades reported both with a numerical grade and an editorial decision of accept, accept with major revisions, accept with minor revisions, or reject. With this modification of a standard assignment, the laboratory assignment attained real-world relevance.

Graphical abstracts are being used by many scientific research journals, in addition to the traditional text abstract, to make the review of literature more visual and engaging for readers. A graphical abstract is a single visual summary of the core of the paper, or key takeaway. The image must be simple, informative, and engaging. Because graphical abstracts are used for online publication of an article as opposed to print, the use of color is encouraged. Text is very limited in a graphical abstract. While the graphical abstract can be a key graph or figure from the article itself, often it is a new construct to communicate the message of the work.

Graphical abstracts were required in student reports to reflect the changing nature of scientific publication and infuse digital literacies into the course. The graphical abstract was worth 10% of the grade for the laboratory report. The graphical abstract had a separate scoring sheet that provided detailed expectations. Students were presented several types of graphical abstracts with multiple examples of each category from authentic research. The strengths and weaknesses for each were discussed. Several examples of high-quality graphical abstracts are presented in *Figure 5* and *Figure 6*.

### **Faculty Development and Digital Studio Support**

The Digital Literacies Workshop offered by CTLE offered essential support for the embedding of digital literacy skills into the Chemistry course. The workshop established the instructor’s background knowledge on digital literacies and provided peer review of proposed project instructions and rubrics.

**Digital Literacies in the Classroom**

Figure 5. Graphical abstract reprinted with permission from Kurushkin, M. & Tracey, C. (2019) *Introducing electron probability density to high school students using a spiral drawing toy*. *Journal of Chemical Education*, doi: 10.1021/acs.jchemed.8b00391. (© 2019, American Chemical Society)

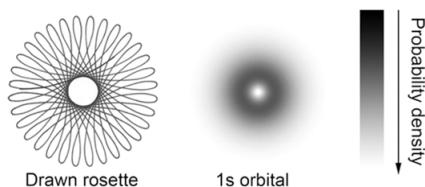
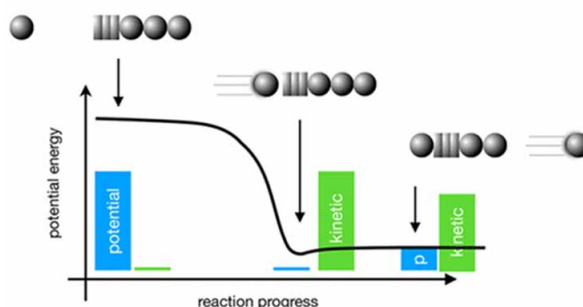


Figure 6. Graphical abstract reprinted with permission from Elliott, L.A., Sippola, E., & Watkins, J. (2019) *Modeling chemical reactions with the gaussian gun*. *Journal of Chemical Education*, 96(1), 100-103. doi: 10.1021/acs.jchemed.8b00709 (© 2019, American Chemical Society)



Post-workshop, Faulconer met several times with CTLE staff to develop and refine the assignments and accompanying rubrics.

For Faulconer's assignments, students were not required to use the Digital Studio. However, the resource was advertised to students as support for their development of graphical abstracts, infographics, and other digital deliverables. While several students utilized the Digital Studio for the development of infographics, no students used the Digital Studio for their graphical abstracts. Regardless, most teams arrived at a high quality graphical abstract to represent their work, with an average score of 8.2 out of 10 points. A student submission is presented in *Figure 7*.

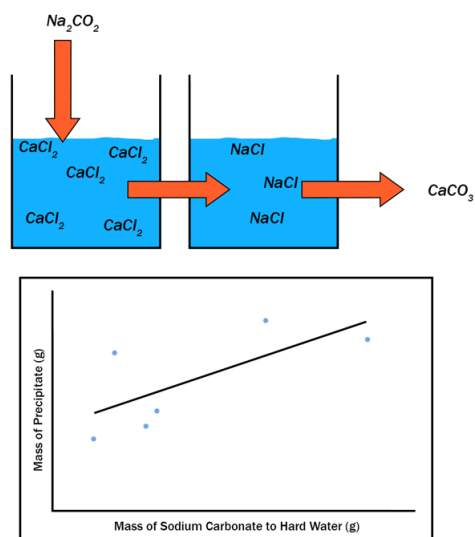
The student's formal laboratory report was prepared based on data they obtained in the inquiry lab on water softeners. They adhered to the basic formatting of a graphical abstract by using a high-quality, simple, organized image to convey a take-home message of the paper. Their image shows how adding sodium carbonate to the hard water forms sodium chloride and precipitates calcium carbonate. The image also shows how increasing the mass of sodium carbonate increases the mass of chalk precipitated from the hard water. They minimized the use of text, only using text for key labels in the image. The graphical abstract was original work, created by the students.

Despite Bancroft's (2016) advice that learners need digital literacy instruction with personalized support, students often will not seek out digital literacy instruction because of assumptions that technology use equates to digital literacy. These skills are not easily transferred. In addition, there are several possible reasons why the Digital Studio was not utilized by more of Faulconer's students. The Digital



## Digital Literacies in the Classroom

Figure 7. Example of student-generated graphical abstract



Studio was a new tutoring space on campus, and many students may have been unfamiliar with it as a potential resource. Second, Faulconer did not require use of the Digital Studio, so students may not have perceived it as an ideal use of their time. Finally, the hours of the Digital Studio, which was in pilot mode and hosted limited hours, may not have aligned with student schedules. Because the students who *did* use the Digital Studio found it useful, and those students who used the studio tended to generate very high-quality deliverables, it could be that a larger marketing campaign to inform students of the purpose and benefits of the Digital Studio would have driven use. Furthermore, allowing for online submissions and feedback could have also expanded its use by removing scheduling as a barrier.

## Assessment

Faulconer's digital literacy assignments for "Chemistry in the Real World" were designed specifically with authenticity in mind and take advantage of several of Lombardi's characteristics of authenticity, including real-world relevance, ill-defined parameters, complexity, allowing for multiple perspectives, opportunities for collaboration, real world assessment, and creating polished products. Because of the strength of the assignment development, students succeeded despite not taking advantage of an important campus resource in the Digital Studio. In summary, the instructor determined that these assignments allowed students to demonstrate mastery of a number of digital literacies, including visual, digital, design, collaboration, and research, important digital literacy skills that students need in "an increasingly visual culture" (Matrix, Hodson, & Hodson 2014).

## Digital Literacies in the Classroom

### RECOMMENDATIONS AND CONCLUSION

The Digital Literacies Initiative developed in response to faculty concerns about students' abilities to effectively communicate highly technical content once they enter the workforce. It has grown from a pilot effort with 7 faculty to over 30 faculty and 1500 students having engaged in digital literacy development at this STEM-focused institution. The experiences of 3 faculty members represented in this chapter have elicited a number of best practices needed to facilitate student engagement:

1. *Assessment should drive development, growth, and maintenance:* The researchers surveyed faculty to determine the extent to which they had concerns about students' development of digital literacies. These data points were persuasive when seeking internal funding from our Provost's office to fund a tutoring space for students. Ongoing assessment of student perceptions of digital literacy acquisition on end-of-course evaluations, tutoring session satisfaction surveys, and faculty focus groups have provided the campus with important information that has helped to identify needs in terms of software and hardware, technology access, faculty development, and other support structures.
2. *Collaborate with your Information Technology (IT) unit on campus:* Identifying software and hardware needs was a crucial first step to developing the Digital Studio. In the absence of a tutoring space, IT can help to identify what resources exist on campus to support students. For example, the campus did not have any Apple technologies available in computer labs and had very few Mac computers on campus at all. Given the fact that many of our students were bringing their Apple products to campus (phones, tablets, laptops, and desktops), the researchers determined these would be needed to facilitate student work on these assignments. In addition, IT staff were crucial in suggesting cost-friendly options for multimedia products. Not all students can afford high-end movie editing software, so options had to be made available to account for a range of products.
3. *Engage with faculty developers to improve teaching materials:* To avoid falling into add "add technology and stir" approach, faculty should instead rely on the expertise of instructional technologists and faculty development teams on campus to guide efforts. In the absence of these important experts who can balance technology and pedagogical concerns, campuses often have faculty who regularly engage students in digital literacy development, such as faculty who teach public relations, visual design, technical report, and other communication/technology courses. These faculty can help guide assignment revisions, rubric development, and teaching techniques.
4. *Create authentic assignments to facilitate deeper student engagement and learning:* As the above assignments illustrate, digital literacy assignments engage students when they are authentic. Digital literacies projects can engage students authentic activities such collaborating in small groups, developing authentic disciplinary genres, creating polished products, and engaging in real-world relevant tasks. The benefits of these literacies are easily understood by administrators, faculty, and students alike in terms of workforce development.
5. *Encourage collaborative assignments to allow students to contribute to and learn from one another:* Many students suffer from the digital divide that separates those that come to our campus with experience and access to digital technologies from those that have not grown up with this same opportunity. Therefore, students in a class will have a range of skills across technologies. If digital literacy assignments are created as group projects, faculty are providing students the opportunities to share knowledge and cross-train one another on digital literacies.

### **Digital Literacies in the Classroom**

6. *Engage the broader campus community:* To promote the work of the Digital Literacies Initiative, an Open House advertised the work of the Digital Studio and encouraged the campus to think broadly about how digital literacies inhabit the work of faculty, staff, and students. Both the university's President and CIO spoke about the importance of digital literacies in workforce development. In addition, Digital Studio tutors were on hand to engage visitors with the technologies in the room in small activities, such as photo editing and greenscreen filming. In addition, a Student Innovation Awards program was launched that required students to submit their ideas in two digital literacy genres: short films and research posters. This award opportunity advertised broadly to students about the availability of the Digital Studio and its important role in developing students' digital literacies outside of curricular efforts.
7. *Encourage faculty to develop their own digital literacies:* Ideally, faculty would create the digital literacy assignment themselves before piloting the assignment with students. While CTLE did not engage faculty in an activity like this, one faculty member chose to create a podcast in advance of developing the details and rubric for the assignment. Having faculty grapple with their own digital literacy development allows them to identify with the tasks they are asking of students. In addition, campuses can encourage faculty to improve their own digital literacies for their own sake. Multimedia literacies are becoming more and more a part of academics' professional lives. Knowing how to create an effectively designed scientific/research poster is a useful set of digital literacies for our STEM faculty to develop, while creating an effective, readable slideshow presentation is a useful set of skills for any faculty member to develop.
8. *Remain focused on digital literacies as opposed to digital technologies:* From the outset of this initiative, the researchers maintained that literacy development was more important than teaching software and hardware skills. Because technologies change with lightning speed, skills such as visual design, aural design, information architecture, and the like are transferable across technological contexts. Assignments that maintain focus on the development of literacies facilitate transfer of these literacies by students to any new technology that may be developed in the future.

The assignments and best practices presented in this chapter demonstrate not only a full range of Bawden's (2008) six central digital literacy competencies, but also the value of digital literacies in creating authentic assignment opportunities for students across the disciplines. Additionally, the partnerships developed between faculty, the Center for Teaching and Learning Excellence, Information Technology, and the Digital Studio demonstrate that, with appropriate resources, professors are empowered to include non-traditional, digital media assignments in the classroom. Students are also supported in the development of the digital literacy skills necessary to produce effective digital media artifacts.

Working with professors across the disciplines to develop and engage students' digital literacy skills allowed the researchers to develop best practices for the inclusion of digital literacy projects in course curricula. These best practices focus on developing and maintaining a support structure for both professors and students, as well as for developing authentic digital literacies project opportunities across the curriculum.

## Digital Literacies in the Classroom

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### **KEY TERMS AND DEFINITIONS**

**Authentic Engagement:** Learning opportunities for students that focus on a range of real-world problems, activities, experiences, and communities with the goal of students developing deep learning that transfers across a variety of contexts.

**Digital Divide:** A technological gap between those with access to and experiences with digital technologies, and those who lack access to technologies, bandwidth, instruction on usage, and other limiting factors.

### ***Digital Literacies in the Classroom***

**Digital Literacies:** A measure of the skills needed to use, evaluate, adapt, and create artifacts in digital environments.

**Graphical Abstract:** A simple, self-explanatory visual summary of the overall message of a research article, designed to attract readers and help them quickly identify the relevance to their research interests.

**Podcast:** Digital audio or video files that are made available to download, usually presented in a series.

### **ENDNOTE**

- <sup>1</sup> Bancroft bases her conclusions on a review of the following scholars: Anderson & May, 2010; Corso & Devine, 2013; Mitchell & Soini, 2014; Pendell et al., 2013; Relles & Tierney, 2013; and Tout et al., 2013.