Building digital literacy through exploration and curation of emerging technologies: A networked learning collaborative.

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Abstract

People readily consume an ever-growing range of emerging technologies while largely unaware of their lack of control over the impact that such networking, devices, data, and processes have on their lives. Since college-educated people are huge consumers of digital products and are expected to participate in networked learning, it is critical to foster student development of an expanded understanding of digital literacy. To address this challenge, we have created instructional materials for instructor and student use of the internationally known repository, "Fabric" of Digital Life (https://fabricofdigitallife.com/).

This research comes as the result of collaboration between the University of Minnesota's Emerging Technology Research Collaboratory (ETRC, https://etrc.umn.edu/), a research group for investigating emerging technologies, and Fabric of Digital Life (https://fabricofdigitallife.com/) and its affiliated Decimal Research Lab at Ontario Tech University. Together, functioning as a collaborative in support of networked learning, we invite and facilitate research on building student digital literacy through examination, contribution, and/or curation of collections regarding emerging technologies. From Spring 2019 to the present, 13 instructors and associated students across nine institutions have developed and are using a set of instructional materials for student exploration and/or curation of collections in this repository.

This paper documents initial instructor discussion and study of student development of digital literacy as a result of use and/or curation of Fabric collections on emerging technologies and the discourses surrounding them. We are beginning to study the abilities that students draw upon when exploring the collections and when determining which artifacts might be included in current collections as well as new collections that might be developed. Collaborative interaction with the editorial team at Ontario Tech University not only enhanced the repository content and development of instructional resources, it also further evolved the metadata for Fabric for external users and the public. At its core, this research examines the potential development of digital literacy through the act of exploring and curating collections on emerging technologies. Critical to this core is the networked learning collaborative in place to foster and support this work.

Keywords

Digital literacy; Emerging technologies; Curation; Networked learning.

Introduction

Emerging technologies have been broadly and rapidly embraced due to their promise of increased efficiency and the allure of personalized data. In higher education, "smart writers" assist with academic writing; artificial-intelligence (AI) chatbots tutor students; analytics predict student performance; and augmented and virtual reality devices amplify performance and extend intelligence. Massive amounts of data are collected, mined, and used to alter human behavior. In higher education and the public sphere, information about technologies is often proprietary and withheld from citizens or is too complex for people to understand. In terms of AI, ethicists have been calling for AI systems to meet high standards for both "transparency and explainability" (Winfield, Michael, Pitt, & Evers, 2019). Floridi and Cowls (2019) note that society is dealing with "the need to understand and hold to account the decision-making processes of AI." Simultaneously, many of the claims made surrounding technologies in higher education are heavily hyped, which obscures the ability to be critical about them and their affordances (Gourlay & Oliver, 2018).

Since college-educated people are huge consumers of digital products, which affect their own digital lives (Pedersen & Aspevig 2018), it is critical to foster student development of an expanded understanding of digital literacy. To date, efforts in higher education have focused largely on information literacy training and how it influences subsequent occupational life. A study of 727 college graduates found that students "were given minimal guidance around the laws, rights and responsibilities, and security for using technology and media (58.1%)" (*Digital Literacy Impact Study,* 2017, pp. 6-7). In the realm of technical communication, moreover, work has revolved mainly around the use of computers for composing and producing meaning (Breuch, 2002; Hovde & Renguette, 2017; Selber, 2004).

To foster student development of an expanded understanding of digital literacy, we constituted a networked learning collaborative as a means for multiple scholars to develop instructional units that range from student use of the collections as a springboard for communication of their digital literacy experiences to more extensive involvement in collecting artifacts and proposing metadata for curation of new collections related to augmented reality, virtual reality, wearables, implantables, and embeddables. As this is an exploratory study, our collective goal is increased understanding of student digital literacy development as a result of student exploration and/or development of curated collections on immersive technologies.

Networked learning collaborative

This research comes as the result of a networked learning collaborative between the University of Minnesota's Emerging Technology Research Collaboratory (ETRC, https://etrc.umn.edu/), a research group for investigating emerging technologies, and the internationally known repository, *Fabric of Digital Life "Fabric"* (https://fabricofdigitallife.com/) and its affiliated Decimal Research Lab at Ontario Tech University (Iliadis & Pedersen, 2018).

Networked Learning Conference attendees are well aware of the often-used definition of networked learning by Goodyear, Banks, Hodgson, and McConnell (2004) who define it as "...learning in which information and communications technology (ICT) is used to promote connections: between one learner and other learners; between learners and tutors; between a learning community and its learning resources" (p. 1). Throughout this project, we use ICT to foster scholar connections in which we construct community and learning resources in support of building digital literacy. Students use ICT for interactions concerning Fabric and connections between learners and tutors as well as between learners. For Jones (2015), such connections and relationships are central to what constitutes networked learning. Similarly, Hodgson, McConnell, and Dirckinck-Holmfeld (2012) view networked learning as co-created, and the experiences and perspectives of others are needed for learning, and in this case, for expanded understanding of digital literacy to take place. ETRC members and Fabric leadership develop and maintain connections with people and information, communicating regularly (via Zoom) in support of this research (Dircknick-Holfmeld, Jones, & Lindström, 2009).

Defining digital literacy

Based on this collaborative's extensive review of documents related to digital technologies and literacy, we note that Stordy (2013) articulates digital literacy as "The abilities a person or social group draws upon when interacting with digital technologies to derive or produce meaning, and the social, learning and work-related

practices that these abilities are applied to" (p.472). A further expanded definition of being digitally literate "implies making ethically informed choices and decisions about digital behaviour... digital safety, digital rights, digital property, digital identity and digital privacy" (Traxler, 2018, p.4). Noting the challenge of "navigating varied definitions for digital literacy" (p.91), after reviewing iterations of digital literacy definitions from the mid-1990s onward, Ferrar (2019) shares Virginia Tech University's use of the Joint Information Systems Committee (JISC) Digital Capability Framework (2020) developed in the UK as particularly influential to the institution's understanding of digital literacy. Through an extensive review of articles, reports, frameworks, specifications, and standards as well as interviews, JISC leadership identified key issues in framing how to expand digital know-how, defining digital literacies as "the capabilities which fit someone for living, learning and working in a digital society." In this framework, digital literacy capabilities include the following: ICT proficiency; data and media literacies; digital creation, problem solving and innovation; digital communication, collaboration and participation; digital learning and development; and digital identity and wellbeing.

When networked learning collaborative members studied and discussed these elements of digital literacy in terms of student use of the Fabric archive, statements from this JISC framework that were noted as most relevant (documented in meeting notes) include the following:

- ICT Proficiency: "The capacity to stay up to date with ICT as it evolves…[and] an understanding of how digital technology is changing practices at work, at home, in social and in public life;"
- Information, data and media literacies: "The capacity to find, evaluate, manage, curate, organise and share digital information...to collate, manage, access and use digital data in spreadsheets...and to curate, re-edit and repurpose media, giving due recognition to originators;"
- Digital creation, problem solving and innovation: "The capacity to design and/or create new digital artefacts and materials...to use digital evidence to solve problems and answer questions; collect and collate new evidence; evaluate the quality and value of evidence; and to share evidence and findings using digital methods;"
- Digital communication, collaboration and partnership: "The capacity to participate in digital teams and working groups; an understanding of the features of different digital tools for collaboration; and an understanding of how digital media and networks influence social behavior;"
- Digital learning and development: "The capacity to identify and use digital learning resources [and] participate in learning dialogues;" and
- Digital identity and wellbeing: "to manage digital reputation (personal and organisational) across a range of platforms [and] act safely and responsibly in digital environments."

The largest amount of discussion to date has focused on the development of guided prompts for use across deployments in studying student development of digital literacy. One member shared how he connected the JISC elements to possible guided prompts for students:

> I used these prompts to focus rather directly on [my] class's integration of the Fabric project into our study of modern theories of rhetoric. These may need to be de-coupled from the course learning objectives for broader use, but I wanted to provide this localized approach as a generative starting point. As I have considered Gee's (2017) approach to literacy as uses of secondary language, I wonder if our participation in the Fabric of Digital Life as a digital archive represents the context of our language uses. While a 'primary language use' of the archive might be curation, one secondary language use may be applied rhetoric; digital literacy in this space represents recognition and understanding of the rhetorical dimensions of building and managing digital archives. Other secondary language uses certainly exist, including content (understanding the artifacts themselves), cultural studies (recognizing the social-cultural moment from which these artifacts emerge), or applied technology (recognizing the technical challenges of building a digital archive).
>
> 1. To what extent has your contribution to the Fabric of Digital Life influenced your understanding of rhetorical agency? [relates to JISC capability: Digital creation, problem solving and innovation]
> 2. How has your work around the Fabric of Digital Life contributed to your understanding of digital archives? [relates to JISC capability: Digital learning and development]
> 3. What has the Fabric of Digital Life demonstrated about the role of curators in a digital collection? [relates to JISC capability: Digital identity and wellbeing]

However, according to Gourlay and Oliver (2016), such use of JISC and other frameworks that seek to define digital literacy "based on capabilities or features of learners" may lose sight "of important aspects of student engagement with technologies" (p.78). Gourlay and Oliver prefer the European Union's DigEuLit project definition provided by Martin and Grudziecki (2006):

> Digital Literacy is the awareness, attitude and ability of individuals to appropriately use digital tools and facilities to identify, access, manage, integrate, evaluate, analyse and synthesize digital resources, construct new knowledge, create media expressions, and communicate with others, in the context of specific life situations, in order to enable constructive social action; and to reflect upon this process. (p.255)

In addition, similar to Hamilton (2012), we recognize that these many definitions and their associated narratives "help to organize and control this diverse and changing landscape" (p.3). As a networked learning collaborative, we too have difficulty defining digital literacy and studying the impact of Fabric use on building student digital literacy. However, as our students explore and/or curate Fabric collections, they clearly "identify, access, manage, integrate, evaluate, analyse and synthesize digital resources, construct new knowledge, create media expressions, and communicate with others" (Martin & Grudziecki, 2006, p.255). As scholars and instructors, we situate this work as a means to build digital literacy.

Overview of deployments to date

During Spring 2019, three University of Minnesota ETRC members used Fabric collections in their design of instruction for expanding student understanding of emerging technologies as related to technical and international communication. Instructional units ranged from student use of the collections as a springboard for dialogue of their digital literacy experiences to more extensive involvement in collecting artifacts and proposing metadata for curation of new collections related to augmented reality, virtual reality, wearables, implantables, and embeddables. In collaboration with Ontario Tech University colleagues (Isabel Pedersen, Sharon Caldwell), we used the customized, open access CollectiveAccess software, Fabric's public web interface to identify, collect, archive, catalogue, revise and analyze the discourses (i.e., articles, images, audios, videos, other artifacts and events) surrounding emerging technologies to assist in student exploration and/or curation of the collections.

Fabric's scope of representations also seeks to situate emergent, embodied, personal technologies within broader digital cultural discourses. One goal is to reject purely technical description of inventions made available through engineering or computer science channels. The aim is to contextualize technological emergence within both traditional and non-traditional cultural spheres such as journalism, broadcast news, marketing outlets, tradeshow videos, academic research venues and social media outlets, to reveal how digital technology is evolving. Within its 'timeline,' it enables examination for past and future-proposed technologies. Through its extensive metadata categories, Fabric recognizes and reveals ideologies, value-systems, and fictional narratives that drive technological innovation for both better or worse. In line with Gourlay and Oliver's (2018) goal to achieve a "sociomaterial understanding" of the "embodied practices" that students engage with in the digital university to counterbalance assumptions and tech hype, members of this networked learning collaborative asked students to critically engage discourses through Fabric's content and metadata categories. To reiterate, this study works to foster digital literacy through the acts of examining, contributing and curating collections on emerging socio-technical artifacts.

An outcome of the Spring 2019 work was the development of instructional materials for potential use across multiple disciplines as a means to build digital literacy through exploration and/or curation of collections on emerging technologies; see https://sites.google.com/umn.edu/buildingdigitalliteracy/home. Development included metadata spreadsheets, instructional videos, and guides to break down steps for students and instructors. We met weekly throughout the term, developing and pilot testing instructional materials to guide students in learning a common language of classification to ground their understanding of technical emergence. Another outcome was a keyword schema that helps students to standardize the constantly evolving language used to describe emerging technology. Finally, this feedback informed the development of a contributor's web interface to facilitate contributions for the future phases of the study.

This use of the Fabric archive took place in both upper level technical and professional writing and advanced/graduate level Writing Studies courses as part of short (one week) to longer (4 week) assignments. Students developed and published six Fabric collections at the site: Emerging Technologies for Technical Communication; Wearables and Carryables for Everyday Communication; What Language Sounds Like: Wearable Devices in Translation Communication; Cultural Reality--A VR Experience; AR from Conception to Reality; and Implanted and Embedded Medical Devices. Two screenshots of the first collection are shown in Figure 1.

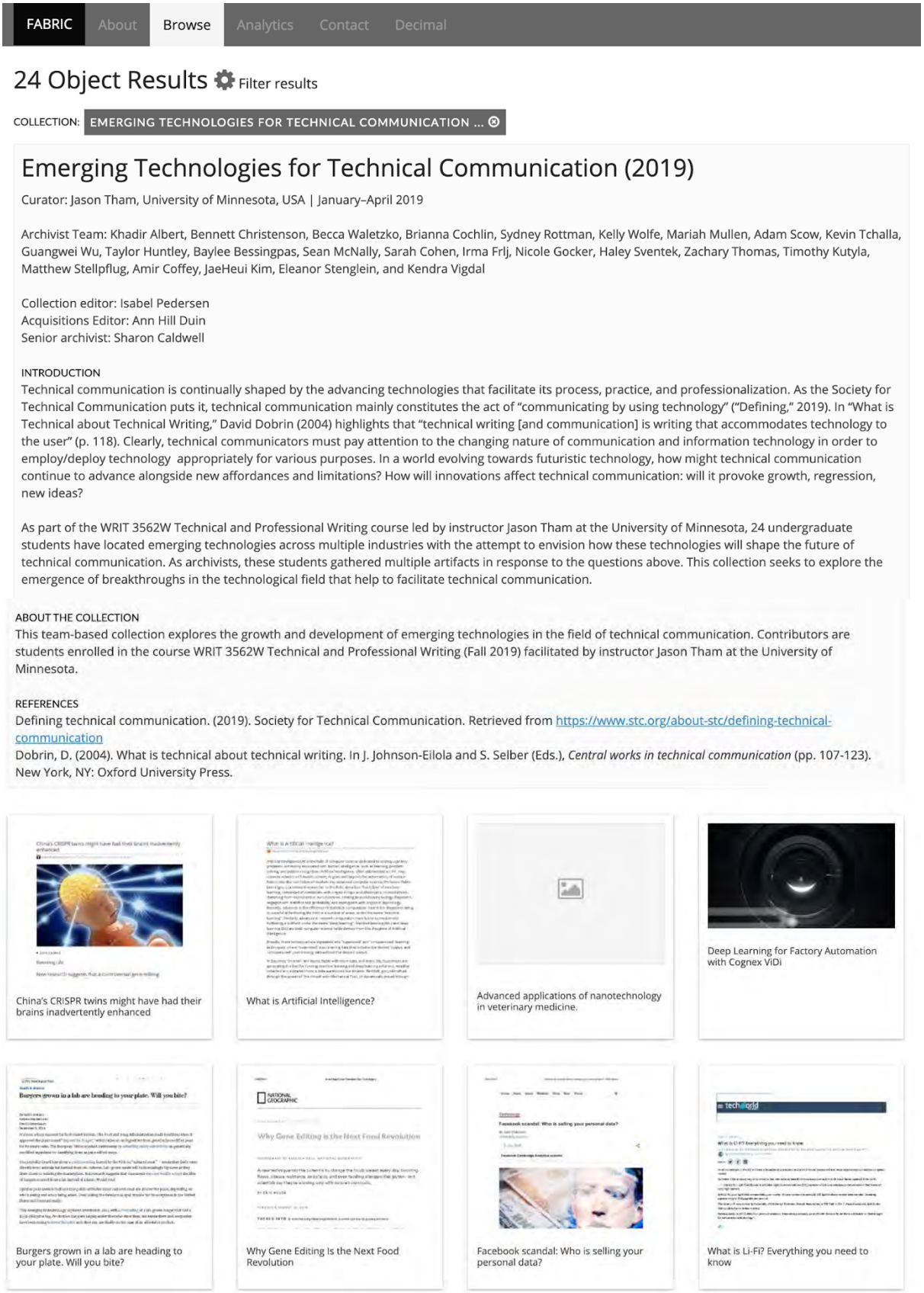

Figure 1: Two screenshots from the Fabric collection, Emerging Technologies for Technical Communication, developed in Spring 2019 by undergraduate students at the University of Minnesota.

With funding from the Council for Programs in Technical and Scientific Communication (CPTSC) and in collaboration with Jason Tham from Texas Tech University, we invited CPTSC and Association of Teachers of Technical Writing (ATTW) instructors to join this networked learning collaborative, with the proposed outcome being increased understanding of student development of digital literacy as a result of exploring, contributing, and/or curating collections of artifacts on emerging technologies.

During Fall 2019, eight instructors at five U.S. institutions took part in this networked learning collaborative, meeting bi-weekly to share updates, provide advice and receive direction on Fabric use and the curation process, and refine collective understanding of digital literacy. Each assignment or project in a writing or technical communication course has been equivalent to a mini-case study on student development of digital literacy as a result of exploring and/or curating collections on emerging technologies. On the editorial side at Fabric, the contributor's interface meant the team could see all submissions and work collaboratively during the publication process. Each item submitted was checked against the metadata scheme for consistency; sometimes items were edited and revised by Fabric archivists in consultation with ETRC members.

Instructor reports and meeting notes indicate that students across undergraduate and graduate levels benefit from use and/or curation of collections on immersive technologies as a means to build digital literacy. Students benefit from the information architecture of Fabric, understanding metadata and accessing information, the metaphor of libraries and seeing the website as a collection with artifacts that are navigated and how suitable items are identified, submitted, and accessed.

Across all deployments Fall 2019, students were surveyed using these questions developed by the networked learning collaborative:

- To what extent is your work with the Fabric of Digital Life influencing your understanding of digital literacy?
- What are the most challenging aspects of this assignment? Why? How did you overcome them?
- Were there any mental models, metaphors, or other experiences you've had that you used as a way to understand Fabric as you worked with it? If so, can you say a little about them?

Based on initial analysis of survey results, we have learned that students explicitly engage prior knowledge (mental models) and metaphors in learning this new tool, thus informing our developing framework for building digital literacy.

Based also on initial thematic analysis of meeting notes, members of this networked learning collaborative have articulated a digital archive as applied posthuman rhetoric, where agency emerges from the interplay of multiple actors including curators, collectors, users, digital artifacts, editors, archive infrastructure, other software applications, and constraints of curatorial tools. Members have explored the relationship between archives and rhetoric; what collecting and curating an archive means as a rhetorical activity; and which of these metadata options best assist student understanding and agency. Members have articulated "productive ambiguity" in the deployment process, noting how it shapes student journeys in learning and fosters digital literacy.

Conclusion

This networked learning collaborative has generated a number of skills in relation to the creation of curations to encourage a more sophisticated recognition of time (e.g., how digital phenomena progress, evolve, or disrupt a domain) as an asset for digital literacy. As a repository, Fabric offers a method to chart past and present inventions, digital practices, and implications. Simultaneously, Fabric provides a method to chart future emergence implied in relevant discourses. For instance, new technical innovations pass from instantiation in very early phase research papers given at academic conferences, to pre-release videos that represent (and celebrate) the same but more advanced version of a technology years later, to advertising campaigns that finally launch an emergent product. Miller (1994) defines the phenomenon of Kairos, or 'technological forecasting'" as a unique discourse "in which the characterization and construction of moments in the present are crucial to the projection of the future" (p.82). Fabric provides teams a means to analyze through forecasting and the dynamically unfolding conditions which allow for digital emergence. With its *timeline* feature, multiple ways to display metadata, and the analytics page, Fabric provides instructors and students novel ways to view digital artifacts and their temporal contexts. Many of the curations contextualized technologies as future projections, using the metadata to classify relevant emergent innovations, such as artificial Intelligence or neurotechnologies.

In terms of networked learning, de Laat and Ryberg, in their introduction to the 2018 NLC collection (Dohn et al.), write that "we might be experiencing a growing interest in forms of learning that are social in a different way than suggested by collaborative learning, communities, or communities of practice" and that

> the next 'wave' in educational technology and networked learning research might involve a growing interest in the importance of being networked in the sense of personal, social networks in a global learning landscape, where the core is not necessarily learning communities and group learning, but rather a greater attention to the degrees of freedom and choice that social networks and learning relationships provide – as well as the challenges of such personalised, social networks to central networked learning values such as community and collaboration (p.18).

Interestingly, students involved in exploring and/or curating Fabric collections to date also have explored social networks and learning relationships, in one case, proposing a collection on specific social media platforms.

As phase three of this work now begins (Spring 2020), we are focusing in more detail on the abilities that students draw upon when exploring the collections and when determining which artifacts might be included in current collections as well as new collections that might be developed. We also are employing collaborative autoethnography (CAE) methodology for continued study of building digital literacy through exploration and curation. CAE is a qualitative research method in which a combination of multiple voices interrogate a social phenomenon (in this case, the building of digital literacy through collaborative curation) to create a unique synergy and approach (i.e., a model for expanding digital literacy) not easily obtained from work in isolation (Chang, Ngunjiri, & Hernandez, 2013). Social networks and learning relationships are central to this work.

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