



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 12, Issue 9, September 2023

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.423

9940 572 462

6381 907 438

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Role of English Communication Skills in Engineering

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ABSTRACT: Technical /engineering communication (or Tech Comm) is communication of technical subject matter such as engineering, science, or technology content. The largest part of it tends to be technical writing, though importantly it often requires aspects of visual communication (which in turn sometimes entails technical drawing, requiring more specialized training). Technical communication also encompasses oral delivery modes such as presentations involving technical material. When technical communication occurs in workplace settings, it's considered a major branch of professional communication. In research or R&D contexts (academic or industrial), it can overlap with scientific writing.

Technical communication is used to convey scientific, engineering, or other technical information.^[1] Individuals in a variety of contexts and with varied professional credentials engage in technical communication. Some individuals are designated as technical communicators or technical writers as their primary role; for some others, the role is inherently part of their technical position (e.g., engineers). In either case, these individuals utilize appropriate skills to research, document, and present technical information as needed. Technical communicators may use modalities including paper documents, digital files, audio and video media, and live delivery.

The Society for Technical Communication defines the field as any form of communication that focuses on technical or specialized topics, communicates specifically by using technology, or provides instructions on how to do something.^{[2][3]} More succinctly, the Institute of Scientific and Technical Communicators defines technical communication as factual communication, usually about products and services.^[4] The European Association for Technical Communication briefly defines technical communication as "the process of defining, creating and delivering information products for the safe, efficient and effective use of products (technical systems, software, services)".^[5]

Whatever the definition of technical communication, the overarching goal of the practice is to create easily accessible information for a specific audience.^[6]

KEYWORDS-technical,professional,engineers,software,digital,documents

I. DISCUSSION

Technical /engineering communicators generally tailor information to a specific audience, which may be subject matter experts, consumers, end-users, etc. Technical communicators often work collaboratively to create deliverables that include online help, user manuals, classroom training guides, computer-based training, white papers, government documents, industrial videos, reference cards, data sheets, journal articles, and patents. Technical domains can be of any kind, including the soft and hard sciences, high technology including computers and software, and consumer electronics. Technical communicators often work with a range of subject-matter experts (SMEs) on these projects.

Technical communication jobs include the following:^[3] API writer, e-learning author, information architect, technical content developer, technical editor, technical illustrator, technical trainer, technical translator, technical writer, usability expert, user experience designer, and user interface designer. Other jobs available to technical communicators include digital strategist, marketing specialist, and content manager.

In 2015, the European Association for Technical Communication published a competence framework for the professional field of technical communication.^[7]

Much like technology and the world economy, technical communication as a profession has evolved over the last half-century.^{[8][9]} In a nutshell, technical communicators take the physiological research of a project and apply it to the communication process itself.

UX Design in Technical Communications

Historically, Technical & Professional Communication (TPC) has been as an industry that practices writing and communication. However, recently User Experience (UX) Design has become more prominent in TPC as companies look to develop content for a wide range of audiences and experiences.^[10]

The User Experience Professionals Association defines user experience, or UX, as "Every aspect of the user's interaction with a product, service, or company that make up the user's perception of the whole."^[11] Therefore, "user experience design as a discipline is concerned with all the elements that together make up that interface, including layout, visual design, text, brand, sound, and interaction."^[11]

It is now an expectation that technical communication skills should be coupled with UX design. As Verhulsdonck, Howard, and Tham state "...it is not enough to write good content. According to industry expectations, next to writing good content, it is now also crucial to design good experiences around that content." Technical communicators must now consider different platforms such as social media and apps, as well as different channels like web and mobile.^[10]

As Redish explains, TPC no longer writes content but "writes around the interface" itself as the user experience surrounding content is developed. This includes usable content customized to specific user needs, that addresses user emotions, feelings, and thoughts across different channels in a UX ecology.^{[12][10]}

Lauer and Brumberger further assert, "...UX is a natural extension of the work that technical communicators already do, especially in the modern technological context of responsive design, in which content is deployed across a wide range of interfaces and environments."^[13]

Content creation

Technical communication is a task performed by specialized employees or consultants. For example, a professional writer may work with a company to produce a user manual. Some companies give considerable technical communication responsibility to other technical professionals—such as programmers, engineers, and scientists. Often, a professional technical writer edits such work to bring it up to modern technical communication standards.

To begin the documentation process, technical communicators identify the audience and their information needs. The technical communicator researches and structures the content into a framework that can guide detailed development. As the body of information comes together, the technical communicator ensures that the intended audience can understand the content and retrieve the information they need. This process, known as the writing process, has been a central focus of writing theory since the 1970s, and some contemporary textbook authors apply it to technical communication. Technical communication is important to most professions, as a way to contain and organize information and maintain accuracy.

The technical writing/engineering writing process is based on Cicero's 5 canons of rhetoric, and can be divided into six steps:

1. Determine purpose and audience
2. Collect information (Invention)
3. Organize and outline information (Arrangement)
4. Write the first draft (Style)
5. Revise and edit (Memory)
6. Publish output (Delivery)

Determining purpose and audience

All technical communication serves a particular purpose—typically to communicate ideas and concepts to an audience, or instruct an audience in a particular task. Technical communication professionals use various techniques to understand the audience and, when possible, test content on the target audience. For example, if bank workers don't properly post deposits, a technical communicator would review existing instructional material (or lack thereof), interview bank workers to identify conceptual errors, interview subject matter experts to learn the correct procedures, author new material that instructs workers in the correct procedures, and test the new material on the bank workers.

Similarly, a sales manager who wonders which of two sites is better for a new store might ask a marketing professional to study the sites and write a report with recommendations. The marketing professional hands the report off to a technical communicator (in this case, a technical editor or technical writer), who edits, formats, and sometimes

elaborates the document in order to make the marketing professional's expert assessment usable to the sales manager. The process is not one of knowledge transfer, but the accommodation of knowledge across fields of expertise and contexts of use. This is the basic definition of technical communication.

Audience type affects many aspects of communication, from word selection and graphics use to style and organization. Most often, to address a particular audience, a technical communicator must consider what qualities make a text useful (capable of supporting a meaningful task) and usable (capable of being used in service of that task). A non-technical audience might misunderstand or not even read a document that is heavy with jargon—while a technical audience might crave detail critical to their work such as vector notation. Busy audiences often don't have time to read entire documents, so content must be organized for ease of searching—for example by frequent headings, white space, and other cues that guide attention. Other requirements vary according to a particular audience's needs.

Technical communicators may need to translate, globalize, or localize their documents to meet the needs of audiences in different linguistic and cultural markets. Globalization involves producing technical content that meets the needs of "as many audiences as possible," ideally an international audience.^[14] Localization adapts existing technical content to fit the "cultural, rhetorical, educational, ethical, [and] legal" expectations of users in a specific local context.^[14]

Technical communication, in the government, is particular and detailed. Depending on the segment of government (and country), the government component must follow distinct specifications. Information changes continuously and technical communications (technical manuals, interactive electronic technical manuals, technical bulletins, etc.) must be updated.

Collecting information

Technical/engineering communicators must collect all information that each document requires. They may collect information through primary (first-hand) research—or secondary research, using information from existing work by other authors. Technical communicators must acknowledge all sources they use to produce their work. To this end, technical communicators typically distinguish quotations, paraphrases, and summaries when taking notes.

Organizing and outlining information

Before writing the initial draft, the technical communicator organizes ideas in a way that makes the document flow well. Once each idea is organized, the writer organizes the document as a whole—accomplishing this task in various ways:

1. chronological: used for documents that involve a linear process, such as a step-by-step guide that describes how to accomplish something;
2. parts of an object: Used for documents that describe the parts of an object, such as a graphic showing the parts of a computer (keyboard, monitor, mouse, etc.);
3. simple to complex (or vice versa): starts with easy ideas and gradually goes into complex ideas;
4. specific to general: starts with many ideas, then organizes the ideas into sub-categories;
5. general to specific: starts with a few categories of ideas, then goes deeper.

After organizing the whole document, the writer typically creates a final outline that shows the document's structure. Outlines make the writing process easier and save the author time.

Writing the first draft

After the outline is complete, the writer begins the first draft, following the outline's structure. Setting aside blocks of an hour or more, in a place free of distractions, helps the writer maintain a flow. Most writers prefer to wait until the draft is complete before any revising so they don't break their flow. Typically, the writer should start with the easiest section, and write the summary only after the body is drafted.

The ABC (abstract, body, and conclusion) format can be used when writing a first draft of some document types. The abstract describes the subject so that the reader knows what the document covers. The body is the majority of the document and covers topics in depth. Lastly, the conclusion section restates the document's main topics. The ABC format can also apply to individual paragraphs—beginning with a topic sentence that states the paragraph's topic, followed by the topic, and finally, a concluding sentence.

Revising and editing

Once the initial draft is laid out, editing and revising can be done to fine-tune the draft into a final copy. Usability testing can be helpful to evaluate how well the writing and/or design meets the needs of end-users and to suggest improvements [15] Four tasks transform the early draft into its final form, suggested by Pfeiffer and Boogard:

Adjusting and reorganizing content

In this step, the writer revises the draft to elaborate on topics that need more attention, shorten other sections—and relocate certain paragraphs, sentences, or entire topics.

Editing for style

Good style makes writing more interesting, appealing, and readable. In general, the personal writing style of the writer is not evident in technical writing. Modern technical writing style relies on attributes that contribute to clarity: headings, lists, graphics; generous white space, short sentences, present tense, simple nouns, active voice^[16] (though some scientific applications still use the passive voice), second and third person as required

Technical writing as a discipline usually requires that a technical writer use a style guide. These guides may relate to a specific project, product, company, or brand. They ensure that technical writing reflects formatting, punctuation, and general stylistic standards that the audience expects. In the United States, many consider the Chicago Manual of Style the bible for general technical communication. Other style guides have their adherents, particularly for specific industries—such as the Microsoft Style Guide in some information technology settings.

Editing for grammar and punctuation

At this point, the writer performs a mechanical edit, checking the document for grammar, punctuation, common word confusions, passive voice, overly long sentences, etc.

II. RESULTS

Digital/engineering rhetoric can be generally defined as communication that exists in the digital sphere. As such, digital rhetoric can be expressed in many different forms, including text, images, videos, and software.^[2] Due to the increasingly mediated nature of our contemporary society, there are no longer clear distinctions between digital and non-digital environments.^[3] This has expanded the scope of digital rhetoric to account for the increased fluidity with which humans interact with technology.^[4]

The field of digital rhetoric has not yet become well-established. Digital rhetoric largely draws its theory and practices from the tradition of rhetoric as both an analytical tool and a production guide. As a whole, it can be structured as a type of meta-discipline.

Due to evolving study, digital rhetoric has held various meanings to different scholars over time.^[5] Similarly, digital rhetoric can take on a variety of meanings based on what is being analyzed—which depends on the concept, forms or objects of study, or rhetorical approach. Digital rhetoric can also be analyzed through the lenses of different social movements.^[6] This approach allows the reach of digital rhetoric to expand our understanding of its influence.

The term “digital rhetoric” differentiates from the term “rhetoric” because the latter term has been one to be debated amongst many scholars. Only a few scholars like Elizabeth Losh and Ian Bogost have taken the time to really come up with a definition for digital rhetoric. One of the most straightforward definitions for “digital rhetoric” is that it is the application of rhetorical theory (Eyman, 13).

Definition

Evolving definition of 'digital rhetoric'

The following subsections detail the evolving definition of 'digital rhetoric' as a term since its creation in 1989.^[7]

Early definitions (1989–2015)

The term digital rhetoric was coined by rhetorician Richard A. Lanham in a lecture he delivered in 1989^[7] and first formally put into words in his 1993 essay collection, *The Electronic Word: Democracy, Technology, and the Arts*.^[8]

In 2005, James P. Zappen defined digital rhetoric as a space of collaboration and creativity between the composer and the audience.^[9]

Recent scholarship (2015–present)

Drawing influence from Lanham and Losh, Douglas Eyman offered his own definition of digital rhetoric in his 2015 book *Digital Rhetoric: Theory, Method, Practice*. Eyman said digital rhetoric is "the application of rhetorical theory (as analytic method or heuristic for production) to digital texts and performances".^{[10]:44}

Eyman's definition demonstrates that digital rhetoric can be applied as an analytic method for digital texts and as a heuristic for production, offering rhetorical questions that a composer can use to create digital texts.^{[11][10]} Eyman categorized the emerging field of digital rhetoric as interdisciplinary in nature, enriched by related fields such as, but not limited to: digital literacy, visual rhetoric, new media, human-computer interaction, and critical code studies.^[10]

In 2018, rhetorician Angela Haas offered her own definition of digital rhetoric, defining it as "the digital negotiation of information – and its historical, social, economic, and political contexts and influences – to affect change".^[12] Haas emphasized that digital rhetoric does not solely apply to text-based items—it can also apply to image-based or system-based items. Any form of communication that occurs in the digital sphere can be counted as digital rhetoric under Haas' definition.^[13]

Other definitions

Contrary to past conceptions, the definition of rhetoric can no longer be confined to simply the sending and receiving of messages to persuade or impart knowledge. While this represents a primarily ancient Western view of rhetoric, Arthur Smith of UCLA explains that the ancient rhetoric of many cultures, such as African rhetoric, existed independent of Western influence.^[14] Today, rhetoric encompasses all forms of discourse that serve any given purpose within specific contexts, while also simultaneously being shaped by those contexts.^[15]

Some scholars interpret this rhetorical discourse with greater focus on the digital aspect. Casey Boyle, James Brown Jr., and Steph Ceraso claim that "the digital" is no longer just one of the many different tools that can be used to enhance traditional rhetoric, but an "ambient condition" that encompasses our everyday lives.^[16] As technology becomes more and more ubiquitous, the lines between traditional and digital rhetoric will start to blur. In addition, Boyle et al. emphasize the idea that both technology and rhetoric can influence and transform each other.^[4]

Concepts

Circulation

Circulation theorizes the ways that text and discourse moves through time and space, and any kind of media can be circulated. A new form of communication is composed, created, and distributed through digital technologies. Media scholar Henry Jenkins explains there is a shift from distribution to circulation, which signals a move toward an increasingly participatory model of culture in which people shape, share, re-frame, and remix media content in ways not previously possible within the traditional rhetorical formats like print. The various concepts of circulation include:

- Collaboration – Digital rhetoric has taken on a very collaborative nature through the use of digital platforms. Sites such as YouTube and Wikipedia involve opportunity for "new forms of collaborative production".^[17] Digital platforms have created opportunities for more people to enact and create, as digital platforms open doors for collaborative communication that can occur synchronously, asynchronously, over far distances, and across multiple disciplines and professions.^{[17][18]}
- Crowdsourcing – Daren Brabham describes the concept of crowdsourcing as the use of modern technology to collaborate, create, and solve problems collectively.^[19] However, ethical concerns have been raised as well while engaging in crowdsourcing without a clear set of compensation practices or protections in place to secure information.
- Delivery – Whereas rhetoric once relied largely on oral methods, the rise of digital technologies allows rhetoric to be delivered in new "electronic forms of discourse".^[20] Acts and modes of communication can be represented digitally by combining multiple different forms of media into a composite helping to create an easy user experience.^[21] The growing popularity of the Internet meme is an example of combining, circulating, and delivering media in a collaborative effort through file sharing. Although memes are sent through microtransactions they often have a macro-level, large-scale impact.^[22] Another form of rhetorical delivery are encyclopedias, which traditionally were printed and based primarily on text and images. However, modern technological developments now enable online encyclopedias to integrate sound, animation, video, algorithmic search functions, and high-level productions into a cohesive multimedia experience as part of their new forms of digital rhetoric.^[21]

Critical literacy-engineering

Critical literacy is the ability to identify bias in media, under the assumption that all media is biased.^[23] It can also be defined as a communicative tool to lead to social change and promote social action by using a critical lens when approaching social-political topics.^[24] In order to identify bias amid the immense volume of information imposed on digital audiences, individuals need to develop the ability to process and critically examine content—on both familiar and unfamiliar topics.^[25]

In an essay on critical literacy in writing, the University of Melbourne stated the importance of developing these skills through reading and questioning what texts are trying to accomplish. Ultimately, this allows an idea's interpretation to come from the reader, not the writer.^[26]

For example, a study conducted at the Indiana University in Bloomington used algorithms to assess 14 million Twitter messages containing statements about the 2016 U.S. presidential campaign and election. They found that from May 2016 to March 2017, social bots were responsible for causing approximately 389,000 unsupported political claims to go viral.^[27]

Interactivity

Interactivity in digital rhetoric can be defined as the ways in which readers connect to and communicate with digital texts.^[28] For example, readers have the ability to like, share, repost, comment on, and remix online content. These simple interactions allow writers, scholars, and content creators to get a better idea of how their work is affecting their audience.^[29]

Some ways communicators promote interactivity include the following:

- Mind sharing is a way to get collective intelligence—crowd wisdom that is comparable to expert wisdom. The methodology consists of taking a consensus from the crowd—the answer that most minds are suggesting is the best answer. If the question is numeric (like guessing the weight of an ox), this method gives a calculated average or median. If the question is open-ended (like "what car should I buy?"), it gives the most common answer.
- Multimodality is a form of communication that uses multiple methods (or modes) to inform audiences of an idea. It can involve a mix of written text, pictures, audio, or videos. Online journals often embrace multimodality in their issues and articles by publishing works that use more than just written text to communicate the message. While the digital turn in rhetoric and composition has encouraged more discussion, theorization, and pedagogical application of multimodality and multimodal texts, the history of the field demonstrates a continuous concern with multimodal communication beginning with classical rhetoric's concern with delivery, gesture, and memory. All writing and all communication is, theoretically, multimodal.
- Remix is a method of digital rhetoric that manipulates and transforms an original work to convey a new message. The use of remix can help the creator make an argument by connecting seemingly unrelated ideas into a convincing whole. As modern technology develops, self-publication sites such as YouTube, SoundCloud, and WordPress have stimulated remix culture, allowing for easier creation and dissemination of reworked content. Unlike appropriation, which is the use and potential recontextualization of existing material without significant modification, 'remix' is defined by Ridolfo and Devoss as "the process of taking old pieces of text, images, sounds, and video and stitching them together to form a new product".^[30] A popular example of remixing is the creation and sharing of memes.

Procedural rhetoric

Procedural rhetoric is rhetoric formed through processes or practices.^[31] Some scholars view video games as one of these processes through which rhetoric can be formed.^{[31][32]} For example, ludology scholar and game designer Gonzalo Frasca poses that the simulation-nature of computers and video games offers a "natural medium for modeling reality and fiction".^[32] Therefore, according to Frasca, video games can take on a new form of digital rhetoric in which reality is mimicked but also created for the future.^[32] Similarly, scholar Ian Bogost argues that video games can serve as models for how 'real-world' cultural and social systems operate.^[31] They also argue for the necessity of literacy in playing video games as this allows players to challenge (and ultimately accept or reject) the rhetorical standpoints of these games.^[31]

Rhetorical velocity

Rhetorical velocity is the concept of authors writing in a way in which they are able to predict how their work might be recomposed. Jim Ridolfo and Danielle DeVoss first coined this idea in 2009 when they described rhetorical velocity as



"a conscious rhetorical concern for distance, travel, speed, and time, pertaining specifically to theorizing instances of strategic appropriation by a third party".^[33] Author Sean Morey agrees with this definition of rhetorical velocity and describes it as a creator anticipating the response their work with generate.^[34]

For example, digital rhetoric is often labelled using tags, which are keywords used to help readers find, view, and share relevant texts and information. These tags can be found on blog posts, news articles, scholarly journals, and more. Tagging allows writers, scholars, and content creators to organize their work and make it more accessible and understandable to readers.^[29] Therefore, it is important for them to be able to predict how their audience will recompose their works.

Appropriation carries both positive and negative connotations for rhetorical velocity. In some ways, appropriation is a tool that can be used for the reapplication of outdated ideas to make them better. In other ways, appropriation is seen as a threat to creative and cultural identities. Social media receives the bulk of this scrutiny due to the lack of education of its users. Most "contributors are often unaware of what they are contributing",^[35] which perpetuates the negative connotation. Scholars in digital rhetoric—such as Jessica Reyman, Amy Hea, and Johndan Johnson-Eilola—explore this topic and its effects on society.

Visual rhetoric



First, an "initial" meme is created to illustrate some joke or idea.



The "default" skin tone for emojis is yellow.

Digital rhetoric often invokes visual rhetoric due to digital rhetoric's reliance on visuals.^[2] Charles Hill states that images "do not necessarily have to portray an object, or even a class of objects, that exists or ever did exist" to remain impactful.^[36] However, the use of imagery for rhetorical purposes in digital spaces cannot always be easily differentiated from "traditional" physical visual mediums. As such, approaching this concept requires a careful analysis of the viewer, situational, and visual contexts involved.^[37] A prominent part of this concept is its intersection of perspective with technology, as computers allow users to create a curated view for online space. Social media platforms like Instagram,^[38] incredibly realistic deepfakes,^[39] editing software like Photoshop, and even behind-the-scenes preference algorithms all illustrate how the tactile-visual Internet heavily relies on and adapts principles of visual rhetoric.



Then, another user modifies the original to illustrate their own idea; in this image, a "deep fried" effect is added to distort the image.

Digitally-produced art is a significant way users express themselves on technological platforms; the unique intersection of text and image has given rise to new rhetorical language through the modification of slang and ingroup language.^[40] In particular, the culturally-specific and nuanced use of pop culture references through Internet memes have gradually built upon themselves to create complex, highly flexible, and Internet-specific (or even platform-specific) dialects of speech.^[41] Through popularity-based natural selection, edits of commonly accepted meme templates fuel the cycle of rhetorical creation.

Digital-visual rhetoric does not only rely on intentional manipulation. Sometimes, meanings can arise from unexpected places and otherwise-overlooked features. For example, emojis can carry heavy consequences by permeating daily communication. Varying skin tones provided (or excluded) by developers for emojis may perpetuate preexisting racial biases of colorism.^[42] Even otherwise-innocuous images of peaches and eggplants are regular stand-ins for genital regions; they can be both harmless modes of flirtation and tools for sexually harassing women online when sent en masse.^[42]

The concept of the avatar also illustrates visual rhetoric's deeply personal impact, particularly when using James E. Porter's definition of the avatar as an extended "virtual body".^[43] While scholars such as Beth Kolko hoped for an equitable online world free of physical barriers, social issues still persist in digital realms, such as gender discrimination and racism.^[44] For example, Victoria Woolums found that, in the video game World of Warcraft, an avatar's gender identity instigated bias from other characters even though an avatar's gender identity may not be physically accurate to its user.^[45] These relationships are further complicated by the varying degrees of anonymity characterizing inter-user communications in online spaces. While the possibility of true privacy can be facilitated by impersonal avatars, they are still personal manifestations of a user's self in the context of digital spaces.^[46] Furthermore, the tools available to curate and express these are platform-dependent and ripe for both liberation and exploitation. Be it Gamergate or debates regarding social media influencer culture and their portrayals of impossible and computer-edited body image, self-presentation is heavily mediated by accessibility to and mastery of online avatars.^[46]

Forms and objects of study

Infrastructure

Information infrastructure is the underlying organization of public information on the Internet, which impacts how and what the public accesses online.^[47] Databases and search engines are information infrastructure as they play a large role in access to and dissemination of information. Information Infrastructure often consists of algorithms and metadata standards, which curate the information presented to the public.^[48]

Software-engineering

Coding and software engineering are not often recognized as rhetorical writing practices, but in the process of writing code, people instruct machines to "make arguments and judgments and address audiences both mechanic and human".^[49] Technologies themselves can be viewed as rhetorical genres, simultaneously guiding users' experiences and communication with each other and being shaped and improved through humans use.^[50] Choices baked into software that are invisible to users impact the user experience and reveal information about the priorities of the software engineers.^[51] For instance, while Facebook allows users to choose over 50 gender identities to display on their public profile, an investigation into the social media's software revealed that users are filtered into the male-female gender binary within the database for targeted advertising purposes.^[52] For another example, pieces of software

called BitTorrent trackers facilitate the massive distribution of information on Wikipedia.^[50] Software facilitates the collective rhetorical action of this encyclopedia.

The field of software studies encourages the investigation into and recognition of software's impacts on people and culture.^[49]

People

Online communities-engineers

Online communities are groups of people with common interests that interact and engage over the Internet. Many online communities are found within social networking sites, online forums, and chat rooms, such as Facebook, Twitter, Reddit, and 4chan, where members can share and discuss information and inquiries.^[53] These online spaces often establish their own rules, norms, and culture, and in some cases, users will adopt community-specific terminology or phrases.

Scholars have noted that online communities have especially gained prominence among users like e-patients and victim-survivors of abuse.^[54] Within online health and support groups respectively, members have been able to find others who share similar experiences, receive advice and emotional support, and record their own narrative.^[55]

However, online communities face issues with online harassment in the form of trolling, cyberbullying, and hate speech.^[56] According to the Pew Research Center, 41% of Americans have experienced some form of online harassment with 75% of these experiences occurring over social media.^[57] Another area of concern is the influence of algorithms on delineating the online communities a user comes in contact with. Personalizing algorithms can tailor a user's experience to their analytically determined preference, which creates a "filter bubble". The user loses agency in content accessibility and information dissemination when these bubbles are created.^{[58][59]} The loss of agency can lead to polarization, but recent research indicates that individual level polarization is rare.^[60] Most polarization is due to the influx of users with extreme views that can encourage users to move towards partisan fringes from "gateway communities".^[60] In summary, online communities support community but in rare cases can support polarization.



A demonstration of subtle Instagram filters and how radically they can change image perception.

Social media

Social media makes human connection formal, manageable, and profitable to social media companies.^[61] The technology that promotes this human connection is not human, but automated. As people use social media and form their experiences on the platforms to meet their interests, the technology also affects how the users interact with each other and the world.^[61]

Social media also allows for the weaving of "offline and online communities into integrated movements".^[62] Users' actions, such as liking, commenting, sending, retweeting, or saving a post, contribute to the algorithmic customization of their personalized content.^[63] Ultimately, the reach social media has is determined by these algorithms.^[63] Social media also offers various image altering tools that can impact image perception—making the platform less human and more automated.^[64]

Digital activism/engineering

Digital activism serves an agenda-setting function as it can influence mainstream media and news outlets. Hashtags, which curate posts with similar themes and ideas into a central location on a digital platform, aid in bringing exposure to social and political issues. The subsequent discussions these hashtags create put pressure on private institutions and governments to address these issues, as can be seen with movements like #CripTheVote,^[65] #BringBackOurGirls,^[62] or #MeToo. Many recent social movements have originated on Twitter, as Twitter Topic Networks provide a framework for online community organizing. Digital activism allows people who may have not had a voice previously an equal chance to be heard.^[62]

Influencers and content creators

As social media is increasingly becoming more available, the influencer/content creator position has also become recognized as a profession. With such a large and rapid consumer presence on social media, it creates both a helpful and overwhelming source of consumer information for advertisers.^[66] There is substantial potential to identify "market mavens" on social media due to fandom culture and the nature of influencer/content creator followings.^[66] Social media has opened up business opportunities for corporations to employ influencer marketing, where they can more easily find suitable influencers to advertise their products to their viewers.

Online learning-engineering

Although online learning existed previously, its prevalence increased during the COVID-19 pandemic.^[67] Online learning platforms are known as e-learning management systems (ELMS). They allow both students and teachers access to a shared, digital space which includes classroom resources, assignments, discussions, and social networking through direct messaging and email.^[68] Although socialization is a component of ELMS, not all students utilize these resources; rather, they focus on the lecturer as the primary resource of knowledge.¹ The long-term effects of emergency online learning, which many turned to during the height of the pandemic, is ongoing; however, one study concluded that students' "motivation, self-efficacy, and cognitive engagement decreased after the transition".^[69]

Interactive media

Video games-engineered

The procedural and interactive nature of video games leads them to be rich examples of procedural rhetoric.^[70] This rhetoric can range from games designed to bolster children's learning to challenging one's assumptions of their world.^[71] An educational video game developed for students at the University of Texas at Austin, titled Rhetorical Peaks, was made with the goal of examining rhetoric's procedural nature and to capture the constantly changing contexts of rhetoric.^{[72][70]} The open-ended nature of the game as well as the developer's intent on playing the game within a classroom setting encouraged collaboration among students and the development of individual interpretations of the game's plot based on vague clues; this ultimately helped them to realize that there must be a willingness to change between lines of thought and to work within and past limits in understanding rhetoric.¹



The Xbox network, an example of virtual communication between real life and online friends that is embedded in the gaming console.

In mainstream gaming, each game has its own set of language which help shape the way information is transferred between players in their community.^[73] Within the realm of online gaming—which includes games such as Call of Duty or League of Legends—players can communicate with each other and create their own rhetoric within the established world of the game, which allows players to influence and be influenced by the other gamers around them.^[74]

The game Detroit: Become Human has another way of encouraging digital rhetoric within the gaming community. This decision-based video game gives the player the power to create their own story that deals with gender, race, and sexuality. Its futuristic message of a human-to-machine relationship prompts discussion due to the difficult moral decisions made while playing. At the end, there are surveys to take to see other players' opinions about certain decisions around the world.^[75]

Podcasting

Podcasting is also an important form of digital rhetoric. Podcasting can augment the ancient progymnasmata in ways that illuminate the relationship between rhetoric and digital sound.^[76] Podcasting can teach rhetorical practices through soundwriting.^[77] And a rhetorical pedagogy oriented around narrative nonfiction podcasting may--if it can overcome some key limitations--hold the potential to spark social change.^[78]

Mobile applications

Mobile applications (apps) are computer programs designed specifically for mobile devices, such as phones or tablets. Mobile apps cater to a wide range of audiences and needs, and allow for a "cultural hybridity of habit" which allows anyone to stay connected with anyone, anywhere.^[79] Due to this, there is always access to changing cultures and lifestyles, since there are so many different apps available to research or publish work.^[79] Furthermore, mobile apps allow individual users to manage aspects of their lives, while the apps themselves are able to change and upgrade socially.^[80]



Telepresence utilized in a professional setting for meetings.

Information access on mobile devices poses challenges to user interfaces, notably due to the small screen and keys (or lack thereof), in comparison to larger counterparts such as laptops and PCs. However, it also has the advantage of heightening physical interactivity with touch, and presents experiences with multiple senses in this way. With these varying factors, mobile applications need trustworthy, reliable, and helpful UI design and UX design to create successful user experience.^[81]

Immersive media

Emerging immersive technologies such as virtual reality remove the visual presence of devices and mimic emotional experiences.^[82] User immersion into virtual reality includes simulated real-life communication; virtual reality provides the illusion of being somewhere the body physically is not, which contributes to widespread communication that reaches the point of telepresence and telexistence.^[82]

Critical approaches

Technofeminism

Digital rhetoric gives a platform to technofeminism, a concept that brings together the intersections of gender, capitalism, and technology.^[83] Technofeminism advocates for equality for women in technology-heavy fields and researches the relationship between women and their devices. Intersectionality is a term coined by Kimberlé Crenshaw that recognizes the societal injustices based on our identities.^[83] It is often challenging for women to navigate finding and interacting in digital spaces without harassment or gender biases.^[84] There is an importance of digital activism for unrepresented communities, such as gender non-conforming and transgender people of all races, disabled people, and people of color.^[84]

Technofeminism and intersectionality are still not very prevalent when developing new technologies and research.^[83] In the journal *Computers and Composition*, only five articles explicitly use the term intersectionality or technofeminism.^[83] Still, feminists may now communicate with a larger audience, work together, and exchange ideas thanks to modern technology. As a result, they have been able to contest gendered cultural scripts.

Digital cultural rhetoric-engineered

As the Internet has expanded, digital media or rhetoric has come to be used to represent or identify a culture.^[2] Scholars have studied how digital rhetoric is affected by one's personal factors, such as race, religion, and sexuality. Due to these factors, people utilize different tools and absorb information differently.

Digital culture has created the need for specialized communities on the web. Computer-mediated communities such as Reddit can give a voice to these specialized communities. One can experience and converse with other like-minded people on the web via comment sections and shared online migration.^[85] The creation of digital cultural rhetoric has allowed for the use of online slang that other communities may not be aware of. Online communities that explore digital cultural rhetoric allow users to discover their social identity and confront stereotypes that they face (or faced).^[86]

Embodiment

One subset of digital cultural rhetoric is embodiment—the idea that every person has a unique relationship with technology based on their unique set of identities. Studying the relationship between bodies and technology is one way that digital rhetoricians are able to promote equal access and opportunity within the digital sphere.^[12] Since technology is considered to be an extension of the real world, users are also shaped by the experiences they have in digital spaces. The artificial interactions that occur in online environments allow users to exist in a way that is additive to their human experience.^[87]

Pedagogy

With digital rhetoric becoming increasingly present, pedagogical approaches have been proposed by scholars to teach digital rhetoric in the classroom. Courses in digital rhetoric study the intersectionality between users and digital material, as well as how different backgrounds such as age, ethnicity, and gender can affect these interactions.^[88]

Higher education-engineering

Several scholars teach digital rhetoric courses at universities in the US, although their approaches vary considerably.^[2] Jeff Grabill,^[89] a scholar with a background in English, education, and technology, encourages his contemporaries to find a bridge between the scholarly field of digital rhetoric and its implementation. Cheryl Ball^[90] specializes in areas that consist of multimodal composition and editing practices, digital media scholarship, digital publishing, and university writing pedagogy. Ball teaches students to write and compose multimodal texts by analyzing rhetorical options and choosing the most appropriate genres, technologies, media, and modes for a particular situation. Multimodality also influenced *Understanding Rhetoric: A Graphic Guide to Writing* by Elizabeth Losh (et al.), which emphasizes engaging the comic form of literacy.^[91] A similar approach also inspired Melanie Gagich to alter the curriculum of her first-year English course completely, aiming to redefine digital projects as rigorous academic assignments and teach her students necessary audience analysis skills.^[92] Such a design ultimately allowed students in Gagich's classroom to develop their creativity and confidence as writers.^[92]

In another approach, Douglas Eyman recommends a course in web authoring and design that provides undergraduates more practical instruction in the production and rhetorical understanding of digital texts; specifically, it provides opportunities for students to learn fundamentals of web writing and design conventions, rules, and procedures.^[93] Similarly, Collin Bjork argues that "integrating digital rhetoric with usability testing can help researchers cultivate a more complex understanding of how students, instructors, and interfaces interact in OWI [online writing instruction]".^[94]

Other scholars focus more on the relationship between digital rhetoric and social impact. Scholars Lori Beth De Hertogh (et al.) and Angela Haas have published materials discussing intersectionality and digital rhetoric, arguing that the two are inseparable and classes covering digital rhetoric must also explore intersectionality.^{[12][83]} Lauren Malone has also analyzed the relationship between identity and teaching digital rhetoric through research on online engagement of queer and transgender people of color.^[95] From this research, Malone created a series of steps for digital rhetoric instructors to take in order to foster inclusivity within their classrooms.^[95] Finally, scholar Melanie Kill actively introduces digital rhetoric to college-aged students, arguing for the importance of editing Wikipedia and capitalizing on their privilege of education and access to materials.^[96] Similar to De Hertogh (et al.) and Haas, Kill believes an education in digital rhetoric serves all students, as it facilitates positive social change.^[96]

K-12

Many educational systems are framed so that students actively participate in technological systems as designers of digital rhetoric, not passive users.^[1] There are three core goals students have identified for their coursework: building their own digital space, learning all aspects of digital rhetoric (including the theory, technology, and uses), and applying it in their own lives. The ecological system generated by the interactions of students with classmates, digital media, and other individuals is the basis of "interconnected" rhetorical processes and shared digital work.^[1]

Video games are one avenue through which students learn to design the rhetoric and code underlying their technological systems. Video game use has evolved rapidly since the 1980s, and current video games have been

incorporated into education.^[97] Scholar Ian Bogost suggests that video games can be utilized in a multitude of subjects to serve as models for studying the non-digital world. Specifically, he notes that video games could be used as an "entry point" into computer science for students who may not have been interested in the field. Games and game technology enhance learning by operating at the "outer and growing edge of a player's competence".^[98] Games challenge students at levels that cause frustration but preserve motivation to solve the challenge at this edge.

Bogost also notes that video games can be taught as rhetorical and expressive in nature, allowing children to model their experiences through programming. When dissected, the ethics and rhetoric in video games' computational systems is exposed.^[99] Analysis of video games as an interactive medium reveals the underlying rhetoric through the performative activity of the player.^[97] Recognition of procedural rhetoric through course studies reflects how these mediums can augment politics, advertisement, and information.^[97] To help address the rhetoric in video game code, scholar Collin Bjork makes a series of recommendations for integrating digital rhetoric with usability testing in online writing instruction.

Some scholars have also identified specific practices for digital rhetoric instruction in pre-collegiate classrooms. As Douglas Eyman points out, students require agency when learning digital rhetoric, meaning instructors designing lessons must allow students to interact with the technology directly and enact change on the design.^[1] This is consistent with discoveries by other professors, who claim one of the primary goals of students in a digital rhetoric classroom is to create space for themselves, connections with peers, and deeply understand its significance.^[88] These interpersonal connections reflect a "thick correlation between digitalization and empowering pedagogy".^[100]

Pre-K

The United States Government's Office of Educational Technology has emphasized four guiding principles when using technology with early learners:^[101]

1. When used appropriately, technology can be a tool for learning.
2. The use of technology should allow for increased access to learning opportunities for all children.
3. Technology can be used to strengthen relationships between children and their families, early educators, and friends.
4. Technology is most effective when early learners are interacting with adults and peers. Adults can also supervise children online for said effectiveness.

Despite these four pillars, most studies conclude that learning technology for children under the age of two is not beneficial. At most, technology can be used to promote relationship development for these children; for instance, by using video chat software to connect with loved ones at a distance.^[101]

Digital rhetoric as a field of study-engineering

In 2009, rhetorician Elizabeth Losh^[102] offered this four-part definition of digital rhetoric in her book *Virtualpolitik*.^[103]

1. The conventions of new digital genres that are used for everyday discourse, as well as for special occasions, in average people's lives.
2. Public rhetoric, often in the form of political messages from government institutions, that is represented or recorded through digital technology and disseminated via electronically distributed networks.
3. The emerging scholarly discipline concerned with the rhetorical interpretation of computer-generated media as objects of study.
4. Mathematical theories of communication from the field of information science, many of which attempt to quantify the amount of uncertainty in a given linguistic exchange or the likely paths through which messages travel.^[104]

Losh's definition demonstrates that digital rhetoric is a field that relies on different methods to study various types of information, such as code, text, visuals, videos, and so on.^[102]

Douglas Eyman suggests that classical theories can be mapped onto digital media but a larger academic focus should be placed on the "extension of rhetorical theory".^[105] Careers in developing and analyzing the rhetoric in code form a prominent field of study. *Computers and Composition*, a journal established in 1985, focuses on computer communication and has considered the use of "rhetoric as their conceptual framework" and the digital rhetoric in software development.^[105]

Moreover, digital rhetoric is a tool by which different cultures can continue to facilitate their longstanding cultural traditions. In his book, *Digital Griots: African American Rhetoric in a Multimedia Age*, Adam J. Banks states that modern day storytellers, like stand-up comics and spoken word poets, give African American rhetoric a flexible approach that is still true to tradition.^[106] While digital rhetoric can be used to facilitate traditions, select cultures face several practical application issues. Radhika Gajjala, professor at the University of Pittsburgh, writes that South Asian cyber feminists face issues with regards to building their web presence.^[107] Studies on how digital rhetoric implicates various topics are ongoing and encompass many fields.

Research ethics

Writing and rhetoric scholars Heidi McKee and James E. Porter discuss the complicated issue of Internet users posting information publicly on the Internet but expecting the post to be semi-private. This appears contradictory, but socially the Internet is composed of millions of social identities, social groups, social norms, and social influence.^[108] These social aspects of the Internet are important to consider when studying digital topics because the digital and non-digital are getting harder to distinguish from one another.^[109]

A study conducted by Rösner and Krämer in 2016 showed that participants' identities would reflect the norms of these online social groups. Similar to how social groups are seen in an in-person setting, posts on forums, comment sections, and social media are like having a conversation with friends in a public setting. Typically, researchers would not use a conversation heard in public, but an online conversation is not only available to its social group.^[110] James Zappen, in his article "Digital Rhetoric: Toward an Integrated Theory", adds that many of these groups foster a creative and collaborative nature to share information to the public.^[111]

McKee and Porter suggest the use of a casuistic heuristic approach to doing digital research. This method of study is based on focusing on the moral principle of 'do no harm' to the audience and generating needed formulas or diagrams to help guide the researcher when gathering data. It is noted that this method does not provide all the answers. Instead, it is a starting point for the scholar to approach the digital world. More scholars have added their own take to an ethical approach for digital data. Many have a case-based approach with add-on consent from participants (if possible), anonymity to participants, and consideration of what harm could come to the groups being studied.^{[109][112]} Regardless of the ethical approach taken, digital scholars agree that some type of consideration into ethics must be taken when studying the Internet.

Eyman gives background information on ancient rhetoric going all the way back to Aristotle.^[1] The definition of rhetoric provided by the author is accurate. Eyman included illustrations of both conventional and modern rhetoric. Beginning with ancient Greece and the medieval eras, the shift to more modern methods and instances is made. He explains three expression modes: Ethos, Logos, and Pathos. It is crucial to keep in mind that the term "digital" also refers to the physical production of texts, whether they are produced in print or electronically. In rhetorical studies, text can be seen as the medium for persuasive discourse or arguments; however, this tradition is primarily associated with printed texts. 'Electric rhetoric', 'computational rhetoric', and 'technorhetoric' are only a few of the words that were mentioned.^[relevant?]

Social issues

Access

Referred to as the digital divide, issues of economic access and user-level access are recurring issues in digital rhetoric.^[113] These issues show up most prevalently at the intersection of computers and writing, though the digital divide impacts a multitude of online forums, user bases, and communities. A lack of access can refer to inequality in obtaining information, means of communication, and opportunities. For many that teach digital rhetoric in schools and universities, student access to technologies at home and in school is an operative concern.^[114] There is some debate about whether mobile devices like smartphones make technology access more equitable.^[115] In addition, the socioeconomic divide that is created due to accessibility is a major factor of digital rhetoric. For instance, Linda Darling-Hammond, an NIH researcher and professor of education at Stanford University, discusses the lack of educational resources that children of color in America face.^[116] Further, Angela M. Haas, author of "Wampum as Hypertext: An American Indian Intellectual Tradition of Multimedia Theory and Practice", describes access in a more theoretical way. Her text explains that through access one can connect a physical body with the digital space.^[117]

Another contributing factor is technology diffusion, which refers to how the market for new technology changes over time, and how that influences technology use and production across society.^[118] Studies conducted by scholar Sunil Wattal conclude that technology diffusion mimics social class status. As such, technology diffusion varies from

community to community, making it a much greater challenge to ensure access equity across classes. These examples preface the topic that access encompasses every aspect of one's life and must be perceived as such. If accessibility is not resolved at a foundational level, then social discrimination will be further perpetuated.^[116]

Another issue of access comes in the form of paywalls, which can be a major hindrance for education and reduce accessibility to many educational tools and materials. This practice can increase barriers to scholarship and limit information that is open access.^[119] This industry^[which?] has gotten flack for its long history of monopolizing the publishing market and forcing universities to pay over \$11 million annually for access to certain works.^[119] Open access removes the barriers of access fees and the restrictions of copyright and licensing, allowing more equal access to works. Open access and digital rhetoric do not eliminate copyright, but they eliminate restrictions by giving authors the choice to maintain their right to copy and distribute their materials however they choose, or turn the rights over to a specific journal. Digital rhetoric involves works that are found online and open access is allowing more people to be able to reach these works.^[120]

Politics

The increased digitalization of media has amplified the influence of digital rhetoric in politics, as it introduces a new, more direct relationship between politicians and citizens. Digital communication platforms and social networking sites allow citizens to share information and engage in debate with other people of similar or distinct political ideologies, which have been shown to influence and predict the political behavior of individuals outside the digital world.^[121] Some politicians have used digital rhetoric as a persuasive tool to communicate information to citizens. Reciprocally, digital rhetoric has enabled increasing political participation among citizens. Theoretical research on digital rhetoric in politics has attributed the increase of political participation to three models: the motivation model, the learning model, and the attitude model.^[122]

- The motivation model proposes that digital rhetoric has decreased the opportunity costs of participating in politics since it makes information readily available to the people.^[122]
- The learning model established the increase in political participation to the vast amount of political information available on the Internet which increases the inclusion of the citizens in the political process.^[122]
- The attitude model extended from the previous two by suggesting that digital rhetoric has changed the perception of citizens towards politics, particularly by providing interactive tools that allow people to engage in the political process.^[122]

Online harassment

Online harassment has steadily risen alongside social media. As the number of communication platforms have increased, so too has a digital rhetoric that includes an abundance of bullying.^[123] Analysis linked cyberbullying-specific behaviors, including perpetration and victimization, to a number of detrimental psychosocial outcomes. The trend of people posting about their characters and lifestyles reinforces stereotypes (such as "hillbillies"), an outcome based on the fact that the rhetoric of difference is a naturalized component of the ethnic and racial identity.^[124] Due to limits on the number of characters available to convey a message (for example, Twitter's 280-character limit),^[125] messages in digital rhetoric tend to be scarcely explained, allowing stereotypes to flourish. Erika Sparby theorized that anonymity and use pseudonyms or avatars on social media gives users more confidence to address someone or something negatively.^[126]

In 2005, these issues led to the launch of the first cyberbullying prevention campaign: STOMP Out Bullying. Like the abundance of campaigns that would form in the next fifteen years, it focuses on creating cyberbullying awareness and reducing and preventing bullying.^[127] The challenge of bullying within social media has increased following the rise of "cancel culture", which aims to end the career of a culprit through any means possible, mainly the boycott of their works.^[128]

More recently, techniques utilizing machine learning and artificial intelligence have become popular in synthesizing deepfakes: realistic but fake videos of people whose faces are swapped out with other people's faces. These kinds of videos can be created by easily obtainable and simple software, inciting concerns that people may use the software to blackmail or bully people online.^[129] A large quantity of images containing faces are required to create a deepfake. In addition, specific types of characteristics, such as different exposure and color levels, need to be consistent to make a realistic video. However, given the vast amounts of photos of people publicly available on the Internet from social media sites, there is concern about the extent to which people can use deepfakes as a bullying tactic. There have already been multiple incidents of this kind of harassment being used to bully people, one notable one involving a

mother who used deepfake software to frame a few of her daughter's classmates at school by producing fake videos of them in pornographic videos.^[130] Due to machine learning and artificial intelligence being relatively new subfields of computer science and mathematics, there has not been enough time for deepfake video detection technologies to mature, and so far are only detectable using the human eye to spot irregularities in movement of the people in the videos.^[131]

Misinformation and disinformation-engineered

While digital rhetoric can often be used to persuade, in some cases it is used to spread false and inaccurate information. The proliferation of illegitimate information over the Internet has given rise to the term misinformation, which is defined as the spread of false claims that may or may not be intended to mislead others. This is not to be confused with disinformation, which is illegitimate or inaccurate information that is spread with the intent to mislead others. Both misinformation and disinformation have detrimental impacts on the knowledge, perceptions, and, in some cases, actions of susceptible individuals. Social media specifically has greatly impacted the spread of false information.^[132] Scientific facts, such as the damaging environmental impacts of climate change, now come into question on a daily basis.

Social media has contributed to the proliferation of misinformation/disinformation because of its viral and largely unfiltered nature. Everyday users have the power to join and perpetuate a narrative that could be entirely false. In recent years, the term "fake news"—used synonymously with misinformation—has been highly popularized and politicized in digital spaces.^[133]

The effects of misinformation were further on display during the 2020 United States presidential election, where social media usage had an impact on Congress.^[134] Starting as early as April 2020, then-President Donald Trump tweeted about the dangers of widespread mail voting fraud^[135] even though studies have shown that mail voting fraud is rare and the dangers are negligible.^[136] Even after losing the election, Trump continued to use Twitter as his main platform to speak about rigged elections, mail-in voter fraud, and other proven falsehoods.^[135] On January 6, 2021, Congress was set to certify the results of the 2020 election whilst a rally of Trump supporters were protesting the election results based on Trump's claims of fraud. This assembly of his supporters quickly turned violent, as a mob stormed the Capitol with the intent to overturn election results.^[137] The insurrection, which killed five people,^[138] was the culmination of Trump's long thread of disinformation spread on social media. As a result, Trump was permanently suspended from Twitter two days later because his involvement in the insurrection violated Twitter's terms and conditions regarding the "glorification of violence".^[139] Alongside being suspended from other major social media sites such as Facebook and YouTube,^[140] Trump was impeached by the House of Representatives because of his incitement of the insurrection. This incident started a heated debate about social media companies' abilities to limit free speech; ultimately, these companies are still private businesses who are allowed to determine their own terms and conditions as they see fit, which users must agree to in order to use these platforms in the first place.

III. CONCLUSIONS

Legitimacy-engineered

There is controversy regarding the innovative nature of digital rhetoric. Arguments opposed to legitimizing web text are Platonically based, in that they reject the new form of scholarship (web text) and praise the old form (print) in the same way that oral communication was originally favored over written communication.^[141] Originally some traditionalists did not regard online open access journals with the same legitimacy as print journals for this reason; however, digital arenas have become the primary place for disseminating academic information in many areas of scholarship.^[142] Modern scholars struggle to "claim academic legitimacy" in these new media forms, as the tendency of pedagogy is to write about a subject rather than actively work in it.^[143]

Within the past decade, more scholarly texts have been openly accessible, which provides an innovative way for students to gain access to textual materials online for free, in the way that many scholarly journals like Kairos,^[144] Harlot of the Arts,^[145] and Enculturation^[146] are already available through open access.

COVID-19 pandemic-engineered online



When shifting to online learning, many schools utilized video conference applications to continue teaching lessons.

The persistence of the global COVID-19 pandemic has changed both physical and digital spaces. The resulting isolation and economic shutdowns complicated existing issues and created a new set of globalized challenges as it "imposed" a change to the "psychosocial environment".^[147] The pandemic has forced the majority of individuals with Internet access to depend on technology in order to remain connected to the outside world, and on a larger scale, global economies have become reliant on transitioning business to digital platforms.

Additionally, the pandemic forced schools across the globe to switch to an 'online only' approach. By March 25, 2020, all school systems in the United States closed indefinitely.^[148] In search of a platform to host online learning, many schools incorporated popular video chat service Zoom as their method of providing socially distant instruction. In April 2020, Zoom was hosting over 300 million daily meetings, as opposed to 10 million in December 2019.^[149] While some may view online learning as a drop in education quality,^[150] the shift to online learning demonstrated the current state of accessibility to digital information while promoting the use of digital learning through Zoom meetings, YouTube videos, and broadcasting systems such as Open Broadcaster Software.^[151] Still, it is questioned whether or not the switch to online learning has had detrimental impacts on students. In particular, it has been difficult to transition younger students to completely online models of learning.

The pandemic has also contributed to creating misleading rhetoric in online spaces. Heightened public health concerns combined with the accessibility of social media led to the rapid spread of both misinformation and disinformation regarding COVID-19. Some people online theorized that the deadly virus could be cured by the ingestion of bleach, while others believed the disease to have been intentionally started by China in an attempt to take over the world.^[152] Trump also supported taking hydroxychloroquine to prevent the contraction of COVID-19.^[153] The World Health Organization (WHO) has advised on numerous occasions that the drug has no signs of preventing the spread of the virus. Despite their illegitimate nature, these conspiracy theories have spread rapidly in digital spaces. As a result, WHO declared the proliferation of misinformation regarding the virus an "infodemic".^[152] This label caused most social media sites to strengthen their policies relating to false information, but many misleading claims still slip through the cracks.

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