



Tips from the Experts

Academic Librarians Supporting Digital Storytelling in the Sciences

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Abstract

Science curricula in academic settings increasingly emphasize the importance of fostering students' science communication skills through coursework and projects. One technique used to build students' multimedia communication skills is digital storytelling. Digital storytelling allows students to tell a subjective story that engages an audience's interest and empathy using a mixture of visual and audio cues. In the process, students develop their own skills building an emotionally engaging narrative through the interaction of words and imagery, skills that are not usually exercised in a STEM curriculum. At some institutions, instructors of this technique have partnered with librarians, who can offer valuable assistance in the form of copyright support, resource guidance, and technical support. This paper will discuss how science librarians can provide support for digital storytelling in the curriculum.

Storytelling and Science

The significance of science communication skills has taken on new prominence in recent years. Educators increasingly acknowledge that it is important for academic institutions to produce graduates who can communicate the value of their research. Science funding agencies expect scientists to be able to articulate not just the intellectual merit of a research proposal, but the broader impacts of their proposed research on society. The National Science Foundation's (NSF) Broader Impacts criteria, used to assess the merits of proposed research, highlights the ability to communicate findings as an impact:

Broaden dissemination to enhance scientific and technological understanding, for example, by presenting results of research and education projects in formats useful to students, scientists and engineers, members of Congress, teachers, and the general public ([March 2007](#)).

The NSF leadership has further elaborated on these ideals through speeches from key leaders, like Dr. Alan Leshner, who noted the importance of moving beyond traditional models of communication as mere dissemination of information, instead moving towards something more

ambitious: “public engagement—communicating *with* the public rather than *at* the public on scientific research” ([National Science Foundation 2018](#)).

With such goals in mind, academic institutions are exploring how to train students and scientists in effective science communication ([Besley et al. 2015](#)). Researchers have discussed storytelling as a way for science communication to connect with and engage audiences: “Storytelling can be an essential tool to effectively reach a target audience with scientific results. Through a story or a narrative, context is provided to the audience and complex scientific data can be easier to understand and analyse” ([Sundin et al. 2018](#)).

Those who advocate for the value of storytelling in communicating science have noted, however, that storytelling can be distrusted by scientists: “Viewed as baseless or even manipulative, stories are often denigrated with statements such as, ‘the plural of anecdote is not data’” ([Dahlstrom 2014](#)). The potential of stories to misrepresent science through simplification or manipulation of the complexity of scientific findings should not be ignored ([Scott et al. 2013](#)). There are responsible ways of utilizing narrative to illustrate sound scientific concepts and to engage audiences.

Cognitive science has found that narratives are easier to process and recall than purely informational writing. Brains actually engage with narratives differently than they do with non-narrative statements of facts, allowing them to open themselves to persuasion and more effortlessly retain facts when stimulated with a story ([Schank & Abelson 1995](#)). Emotionally engaging stories hold audiences’ attentions and make audiences more likely to take related action as a result of listening to the story ([Zak 2015](#)). Additionally, most audiences have been trained to consume and respond to scientific findings in the context of mass media sources such as news articles and broadcasts, which package those findings as stories ([Dahlstrom 2014](#)).

Science educators have explored how science communication, particularly the art of science storytelling, can both make students better communicators and increase understanding of the content itself ([Jarvinen et al. 2012](#); [Train & Miyamoto 2017](#)). One study found that after teaching science communication skills to science students, the students showed increased confidence and perceived abilities ([Train & Miyamoto 2017](#)). Even students who are going to be researchers and expect to only communicate with other scientists need to communicate the value of their research to employers and funders. To be hired and to receive funding, new scientists must have the ability to tell a story about the value they add to the organization as well as an ability to communicate effectively to diverse audiences, such as laypeople and policymakers, and to communicate in a diverse, global scientific community. Academic institutions are attempting to prepare their science graduates to be better communicators by creating additional curricular requirements, assigning projects designed to build students’ communication skills, and providing additional instructional support in this area ([Jarvinen et al. 2012](#)).

There is additional evidence that multimedia communication in particular can build students’ communications skills and content knowledge. In their careers, students will be expected to employ a mix of visual, verbal, and written skills throughout a variety of media formats ([Jarvinen et al. 2012](#)). At the intersection of digital multimedia technology and traditional storytelling techniques is digital storytelling, which is well situated to allow students to explore their voices as science communicators for the first time.

Digital Storytelling Defined

Digital storytelling was developed in the 1990s by a group of artists and educators interested in exploring the then-nascent digital technologies that put multimedia audiovisual storytelling in reach of the masses for the first time. This collective, based in the San Francisco area, developed the principles underlying digital storytelling that remain in place to this day ([StoryCenter 2018](#)). The organization that grew out of this original collective, StoryCenter, notes that digital storytelling was conceived as a tool for self-expression, and its core principles remain tied to values such as democratizing stories and developing a diversity of stories. The University of Houston's Educational Uses of Digital Storytelling website quotes digital storytelling pioneer Daniel Meadows describing digital storytelling as “short, personal multimedia tales told from the heart” ([Educational uses... 2019](#)). Digital storytelling emphasizes the personal perspective of the storyteller, and it is this that most distinguishes digital storytelling from simple video-making. In digital storytelling, students also learn to experiment with how to weave together images, video, audio, and language to communicate ideas. Students also build technical skills in the software needed to create such videos, and a better understanding of how visuals and sound interact to create meaning for users.

The seven elements of digital storytelling taught to new creators, as defined by Lambert (2009), are: “point of view, dramatic question, emotional content, the gift of your voice, the power of the soundtrack, economy, and pacing.” These seven elements work together to serve as a starting framework for students to build their video.

Point of view is the personal perspective of the creator. In most science writing, the scientist is a dispassionate observer—their personality and their personal stake in the topic should be invisible. In contrast, the intellectual exercise of digital storytelling is to make the scientists themselves the focus. This element of digital storytelling asks students to consider and express their perspective as an individual, teaching students to address subjectivity head-on when speaking about their findings and bringing in why it matters to them.

A dramatic question is the central question or narrative tension driving the story. It is what the story ultimately is about, and should be something that can grab and keep the viewer's attention.

Emotional content flows out of the combined power of the question and the point of view. The viewer should be engaged by both, and should be moved to empathize with the perspective of the creator.

The gift of your voice refers not just to point of view, but also to the unique way that the individual speaker tells their story, choosing language and framing that no one else could. It encourages the creator to think of the unique way they express themselves as a strength and not a liability.

The power of the soundtrack highlights the importance of incidental music and other sound effects in setting a mood.

More than ever, **pacing and economy of time** is a crucial element to teach students. Many contemporary formats, like YouTube videos, have trained consumers to expect information to be presented in punchy, bite-sized formats that do not demand too much time. This, more than anything, may be crucial for digital storytelling learners to master, since concise storytelling that

is honed for impact teaches storytellers to strip away extraneous detail and find the central point of the story.

All of these elements are crucial to a successful digital story.

Digital Storytelling and Science Education

Recognition of the value of scientists who can spin a story is nothing new. Many of the preeminent scientific educators and communicators of the second half of the twentieth century have shared this skill. The late Stephen Hawking brought research about black holes into the public consciousness through an ability to frame scientific breakthroughs in the understanding of physics as a series of compelling stories. While science documentaries like *Cosmos: A Spacetime Odyssey* with Neil deGrasse Tyson are a familiar format for audiences, digital storytelling is different from these, distinguished by its emphasis on the subjective perspective of the creator and building an emotional connection with the viewer.

Digital storytelling grew out of the arts and humanities, and with its emphasis on personal and emotional storytelling may seem to have little to offer science communicators. However, as the sciences are reckoning with the need to persuasively communicate findings to lay audiences, it is precisely these human elements of emotional appeal and human experience that are important for students to identify and communicate in their research. Digital storytelling can teach science students to think about how their personal experience relates to and informs their research and how to articulate their stake in the work. The process of creating digital storytelling videos teaches students how to situate themselves in their own research stories.

A digital story evokes empathy for the presented perspective, and there is some preliminary evidence to suggest that digital storytelling can be effective in achieving these ends for STEM students. As Hill and Grinnell have noted: “In the sciences, in particular, storytelling can help humanize and situate scientific data in real-world terms” ([Hill & Grinnell 2014](#)). One field within STEM where this has been borne out is in the medical and public health field. One study found that storytelling might help to build empathy for patients, specifically marginalized patients, among medical students ([Gubrium 2009](#)). Another advocated the value of exposing medical experts to public health-related digital storytelling efforts by potential patients, explaining that “Recognizing digital storytelling workshop participants as ‘knowers’ offers public health researchers and practitioners the potential to disrupt commonly accepted hierarchies between experts and members of local communities” ([Gubrium et al. 2014](#)). Another study found that medical students who watched digital storytelling videos created to highlight the experiences of those living with disabilities reported improved attitudes towards those subjects, and also agreed that the format helped with understanding and knowledge retention ([Malhotra 2017](#)). There is also some evidence that when STEM students create their own digital storytelling, they further build their understanding of the applicability of the skills they learned in their academic work and their careers ([Hill & Grinnell 2014](#)).

Some scholars in science education have advocated for digital storytelling as a tool to draw in students who might not otherwise be interested in science topics. “Indeed, the story aspect of digital storytelling practice ‘humanizes’ technology, gives it a personal and relational aspect that stands to attract a wider and more diverse group of students” ([Hill & Grinnell 2014](#)). Other researchers have highlighted the potential for digital storytelling to help STEM students prepare to work in a more diversified environment ([Daily & Eugene 2013](#)), and to draw in STEM learners from diverse backgrounds ([Ball et al. 2015](#)). In Daily and Eugene’s study, researchers

developed a framework that targeted three constructs for learning, two broadly associated with the humanities and one with STEM: emotional self-awareness, empathy, and computational thinking. They argue that all three can be developed by teaching students to tell stories in a computational medium like digital storytelling ([Daily & Eugene 2013](#)).

Librarians and Digital Storytelling

Librarians have generally been absent from the conversation around building science communication skills in science students. However, librarians have valuable support to offer to science programs that incorporate digital storytelling lessons into their curricula.

The topic of digital storytelling, and the opportunities for librarians to play a role in supporting it, remains an under-explored topic within the field of library studies, and what few articles do exist are even more unlikely to be written by academic librarians, as opposed to public librarians or school librarians. There are good reasons for academic libraries to be involved, however. In their 2008 book *Fostering Community through Digital Storytelling*, Ohio State University librarians Fields and Diaz ([2008](#)) advocate for the role of libraries in campus digital storytelling initiatives, noting that, “unique among campus units, the academic library not only supports the teaching, learning and research needs of faculty and students but it is a teaching unit in and of itself.” They maintain that the library has “unique gifts to share: content, expertise, institutional repositories, and technology.”

Fields and Diaz ([2008](#)) highlight the role the library can play in promoting and preserving works of digital storytelling, and identify key roles that their academic library plays in supporting digital storytelling:

- Education - providing workshops and learning opportunities to introduce faculty and students to digital storytelling.
- Outreach and assessment - support interdisciplinary promotion of digital storytelling in the form of showcases and conference presentations, and evaluations of the effect of the program on teaching and research.
- Preservation - making the stories created at the university publicly accessible.
- Acting as a clearinghouse for information.

The library at the University of Nevada in Reno is an academic library that has explored a hands-on role in designing academic digital storytelling assignments, with a librarian collaborating with a media specialist and a course instructor to plan what students would learn and do ([Blithe et al. 2015](#)).

While the University of Reno serves as an example of how librarians can become deeply embedded into the process of digital storytelling, this degree of presence in the creation process is not necessary to make a difference. Another example of engagement can be found at Penn State’s College of Earth and Mineral Sciences (EMS), where various instructors in the college have begun incorporating digital storytelling into instruction in response to a broader push towards strengthening students’ communication skills. The librarians were initially approached by the College of Earth and Mineral Sciences’ Writer-in-Residence, a writing tutor who has been using digital storytelling to teach EMS students how to express themselves and communicate scientific concepts. The Writer-in-Residence asked us to develop a library guide directing users to free images and video footage that students could incorporate into their videos, as this was one area of Digital Storytelling she felt she needed particular library support. As we worked with the

College's Writer-in-Residence, this initiative developed into a LibGuide that offered guidance on every step of the process, from constructing a narrative to filming and recording audio, to editing and archiving one's video. The LibGuide may be found [here](https://guides.libraries.psu.edu/digitalstorytelling) (Figure 1). The success of the LibGuide and its usefulness in classes led by the Writer-in-Residence resulted in further collaborations with instructors in the College of EMS. We were invited to speak in other classes on finding resources to help improve digital storytelling. We also hosted consultation sessions with students who had further questions about finding public domain images and navigating copyright. The librarians have since taken the initiative to introduce digital storytelling to other Penn State and local communities and encourage the use of digital storytelling through workshops at conferences. These different models of engagement show that there are a number of ways for librarians to engage and support digital storytelling for science students.



Figure 1: Front page of Penn State's "Digital Storytelling" library guide.

Practical Implications for Librarians

As the librarians at Ohio State University observed, librarians are uniquely situated in the academic world to provide interdisciplinary support in digital storytelling. There are a number of challenges facing science students and faculty undertaking a digital storytelling project for the first time. This section will discuss the issues that librarians should be aware of, and the steps they can take to support students and faculty in advance. Science faculty who are interested in teaching students digital storytelling skills may not have the background in copyright awareness and finding audiovisual media resources to provide instruction and support in these areas, but librarians do.

Librarians often have a grounding in communication beyond a single discipline, which can help with introducing students to the idea that what might be inappropriate in traditional science writing may actually be appropriate in other settings. Additionally, librarians can find and collect relevant resources that fall well outside of the STEM world, operating as interdisciplinary guides to resources.

STEM librarians can support digital storytelling initiatives through instruction, programming, and consultation in the following areas:

Copyright Instruction

Digital storytelling often involves incorporating creative work beyond what the students themselves have created: soundtrack music, sound effects, video clips, and still images are all integrated into a typical digital storytelling video. Students are encouraged to make use of these pieces of media, but must understand how to use them fairly and legally. Librarians have an important role to play in explaining copyright concepts, including introducing students to fair use, public domain, and Creative Commons licenses as they relate to multimedia. In my own digital storytelling instruction, I was invited to discuss these issues with meteorology students in a 400-level undergraduate class. These students had never had to explore the legal issues around creating works that incorporate copyrighted creative material by others before. Many students at this level are already familiar with the concept of plagiarism, but know little or nothing about copyright. The distinction between these related-but-distinct concepts must be explained, as well as the different consequences for their violation. As I note to students, plagiarism is an ethical violation, while copyright violation is a legal issue. I also explain the ways that others' intellectual property can be used without running afoul of copyright laws. This is a challenge, especially for STEM students, because there are guidelines but no quantifiable rules that can absolutely tell students where the line falls in fair use. Instead, students must understand that fair use is a judgment call, and they must use their own best judgment based on the guidelines as they exist, or get permission if fair use is in doubt. Beyond fair use of copyrighted material, students are introduced to other categories of copyright, and taught the value of Creative Commons licenses and public domain works in finding resources that can be freely incorporated into a work.

Finding Audiovisual Resources

Once students have a strong foundational grounding in the kinds of legal restrictions that exist on what materials they can incorporate into their video, librarians can then direct users to resources. Finding audiovisual resources, particularly of a STEM nature, that are not necessarily preserved in arts and humanities databases, poses its own unique set of challenges for students. Librarians can offer tips on finding legally usable audiovisual resources: music, sound effects, stock footage, stock images, and more. Often this will take the form of teaching students both how and where to search—free repositories are frequently changing, going in and out of existence, and going from free to pay-to-use over time. As a result, it is not enough to compile a static list of resources, but to teach students the skills to find what they need in an ever-changing internet landscape.

Finding Tutorial Resources

In addition, librarians are well situated for putting users in touch with tutorials and guides that help them navigate different aspects of the video-making process. This includes putting students in touch with resources on writing and constructing a narrative as well as the technology of video making, such as audio recording, video recording, and video editing. The main form this has taken at Penn State includes creating digital storytelling guides that provide up-to-date lists of resources. Resources in this field are constantly changing, therefore it is important for any librarian planning to create a guide to keep updating it. This includes staying on top of technology, resources that are available around campus, and online resources.

At Penn State, I have developed a LibGuide (Figure 1) that supports students through every step of creating a digital story. The LibGuide starts with writing resources designed to help students

learn the basics of how to construct a narrative, linking to resources on how to storyboard. The guide also provides information on what software and hardware resources are available to them once they start creating and editing video.

Providing Equipment and Technology

Libraries can also find and provide the technology itself to make digital storytelling possible, if that is within the budget and scope of the library's services. This includes providing audio and video recording equipment, as well as professional-level video editing software. Some universities, like Penn State, have multimedia resources spread across different units, with both library affiliates and support units outside the library specializing in studio spaces, equipment rentals, and tutoring in the uses of video recording and editing software like Camtasia. In these situations, partnerships can be crucial in order to better collaborate and inform users of all the resources that are available to them. At many large institutions, technical resources exist that students and even faculty won't know about. Doing the work of compiling information about the institutional and community resources that exist for those who might be making videos for the first time is a valuable contribution.

Preservation

One of the challenges of digital storytelling is the ephemeral nature of digital videos. Libraries can address this by working with students and instructors to identify appropriate preservation solutions to the videos they produce. Many libraries already have procedures in place for preserving streaming videos and digital objects created by students and faculty. Library support for digital storytelling can include providing opportunities for students to upload their work to institutional repositories or working with instructors to identify appropriate online platforms for hosting videos.

Finding and Building Partnerships

For the above reasons and others, it is crucial for librarians to build partnerships with others in the university. This includes directly reaching out to faculty members who are working in digital storytelling to understand their needs. Copyright authorities on campus are often valuable potential partners and can be consulted for information or programming support. In addition, the units on campus already focused on multimedia creation are important potential partners and should be consulted by librarians looking to understand the scope of what resources are available on campus, and to understand where there might be limits in digital storytelling support.

At Penn State, the Libraries' partnerships include our long-term collaboration with the Media Commons unit, which describes itself as an "initiative to enrich the teaching and learning experience through multimedia technology, classroom training and direct support for students, faculty and staff" ([Teaching and Learning with Technology 2019](#)). Media Commons launched the popular One Button Studio, which is a multimedia studio that simplifies the video recording process for new users while still allowing users to create quality video with high-end audio, lighting, and video equipment. The One Button Studio experience has proved popular with many students who are required to make digital stories for classes. The Libraries worked closely with Media Commons to move two of the five One Button Studios into the library and took over full support and operation of those two One Button Studios. This freed staff and operational budgets for Media Commons to focus on running the remaining Studios and on other projects. These partnerships have allowed the Libraries to build on existing structures and services at the

university and provide more centralized support for students exploring digital storytelling for the first time.

Conclusion

Learning to tell stories is a crucial tool for scientists communicating their findings. Disinformation is spread with stories, but scientists can counter disinformation with compelling stories as well. While scientists have traditionally been discouraged from sharing their findings this way, science students can benefit from learning to translate their findings to the realm of multimedia stories, and librarians are well suited to support them in this.

In the program piloted by Penn State's College of EMS, surveys were conducted before and after the digital storytelling project to assess the students' attitude towards science communication. Students reported greater understanding of the value of science communication skills after creating a digital story. Further research will be done to better understand the actual improvements in communication this project confers. Research is also needed to assess how librarian support affects the performance of students creating digital stories, and how librarians might better serve students and faculty working with digital storytelling.

As new teaching techniques emerge to prepare scientists for a future in which they will need to communicate their ideas to the public, librarians should be aware of the role that they can play in giving students the tools they need to create effective digital storytelling videos.

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