Kelly Schrum, GEORGE MASON UNIVERSITY, kschrum@gmu.edu
Niall Majury, QUEEN'S UNIVERSITY BELFAST, n.majury@qub.ac.uk
Anne Laure Simonelli, UNIVERSITY CÔTE D'AZUR, anne-laure.simonelli@univ-cotedazur.fr

Authentic Learning Across Disciplines and Borders with Scholarly Digital Storytelling

ABSTRACT

Scholarly digital storytelling combines academic research and digital skills to communicate scholarly work within and beyond the classroom. This article presents three case studies that demonstrate efforts to integrate scholarly digital storytelling, a technology-enhanced assessment, across disciplines, geographic locations, and teaching contexts. The case studies originate in the United States, Northern Ireland [UK], and Norway, and represent learning across multiple disciplines, including history, higher education, geography, and biology. This article explores the potential for scholarly digital storytelling, when carefully planned, scaffolded, and implemented, to engage students in authentic learning, teaching students to think deeply and creatively about disciplinary content while creating sharable digital products.

INTRODUCTION

Scholarly digital storytelling, broadly defined, involves students integrating academic research, scholarly communication, and digital skills to create digital content (Iordache, Mariën, and Baelden 2017; Payton 2012; Schrum 2021; Snelson 2018). The digital content can take multiple forms, such as a documentary on student persistence in higher education, a story map of urban regeneration in Belfast, or a video tutorial teaching peers about population biology, but it fundamentally combines academic research, digital production, and storytelling. The authors of this article met at an international scholarship of teaching and learning (SoTL) conference and discovered shared student learning outcomes based on scholarly digital storytelling assignments that combine authentic learning with academic research and digital production. We teach in different countries (United States [US], Northern Ireland [UK], Norway) and disciplines (higher education, humanities, sciences, and social sciences), and across varied teaching contexts (undergraduate and graduate). In the first case, scholarly digital storytelling served as the core class assessment, in the second as a capstone project, and in the third as a supplemental assignment. Yet across these differences, the authors found similar authentic learning experiences when integrating scholarly digital storytelling into their teaching practice.

This research explores the potential for scholarly digital storytelling to engage students in authentic learning, teaching students to think deeply and creatively about disciplinary content while creating sharable digital products. This article aims to explore the ways in which scholarly digital

storytelling can promote authentic learning across disciplines as students grapple with open-ended, complex tasks to create digital projects with real-world relevance (Fletcher and Cambre 2009; Gachago, Barnes, and Ivala 2015; Oppermann 2008; Singh 2014).

AUTHENTIC LEARNING

Authentic learning focuses on student learning experiences. At the center are ill-defined, complex learning tasks that "allow competing solutions and diversity of outcome," have real-world relevance, integrate collaboration, and can be applied across disciplinary contexts (Herrington, Reeves, and Oliver 2005). Assessment is embedded in the task and in the final product which is "genuine and worthwhile" (Herrington 2015, 61). Authentic assessment has "the potential to increase student engagement, deepen levels of understanding, [and] increase creativity" (Jopp 2019, 1). This approach marks a fundamental shift from a "traditional focus on teacher-delivered content" toward "pedagogies that focus upon transformative learning experiences for students" (Cochrane, Narayan, and Oldfield 2015, 126). It can be frustrating to adapt to a new, unstructured learning environment, but students typically learn to persevere and adapt (Lombardi 2007; Sleeter et al. 2019).

Digital assessments, such as scholarly digital storytelling, offer the potential to integrate authentic learning with disciplinary content, "providing support for engagement with the real world while creating an archive of a digital trail of student learning" (Ng'ambi and Bozalek 2015, 112). As noted above, however, this is not always the outcome. Puentedura's SAMR model defines four levels of technology integration: substitution, augmentation, modification, and redefinition. In the first level, technology is a substitute for existing processes with no "functional change" in process or learning, while augmentation signifies some "functional improvement," such as spell checking that would not be possible with a handwritten assignment (Puentedura 2006, 2). Modification allows for integration of technology into the learning while redefinition fosters substantive change, allowing "for the creation of new tasks, previously inconceivable" (Puentedura 2006, 4). Puentedura (2006) lists digital storytelling as one of several "technological avenues to transformation" (31).

SCHOLARLY DIGITAL STORYTELLING

Effective use of digital assessments to promote authentic learning requires educators to "continually rethink knowledge practices" and to "embed that rethinking in specific disciplinary and professional contexts of practice" (Littlejohn, Beetham, and McGill 2012, 552). Effecting change beyond an individual classroom or community, however, requires a commitment to systematically studying student learning and disseminating the results (Barr and Tagg 1995; Felton 2013; Felton and Chick 2018; Hutchings and Shulman 1999; Manarin et al. 2021). As there is a demonstrated need for more research on the "effective adoption of technology-enhanced assessment" (Jopp 2019, 5), the authors investigated the ways in which scholarly digital storytelling can facilitate authentic learning across disciplines and teaching contexts. The research on scholarly digital storytelling is limited and the addition of "scholarly" is relatively new (Schrum 2021), but faculty have implemented versions of this approach in a range of settings (Snelson 2018). Fletcher and Cambre (2009) asked graduate and undergraduate students in a visual anthropology course at the University of Alberta in Canada to create digital stories that "address theoretical and topical issues pertinent to the discipline" (110). They

adopted this approach because the "form of the pedagogical tool shapes the ways in which learning takes place" and digital storytelling "is transformative and pedagogical, very different from the typical educational experience" (Fletcher and Cambre 2009, 122). In a graduate seminar on technology, culture, and development at Georgetown University in the US, students created a development remix that engaged them "differently with audiovisual representations" and allowed students "to understand how hard it is to represent peoples' lives and the complex circumstances in which they are embedded" (Singh 2014, 244).

Scholarly digital storytelling is inherently digital and the iterative process of media production engages students in "questions of agency, authority, and knowledge production" (Fletcher and Cambre 2009, 112). Students learn to "communicate and express their ideas" digitally (Chan, Churchill, and Chiu 2017, 1), understand underlying processes and choices, and develop a "critical and practical knowledge of digital text production—a critical digital literacy" (Pangrazio 2016, 166). This knowledge can foster new awareness of the media students consume inside and outside of the classroom (Walters and von Gillern 2018) as students learn to create content through visual narratives. Students engaged in scholarly digital storytelling acquire a "full range of digital literacies," including "innovative multimodal literacies" (Gachago, Barnes, and Ivala 2015, 182). The experience also trains students in disciplinary thinking, making "expert strategies visible and explicit" (Oppermann 2008, 171), facilitating "deeper learning of subject content" (Jopp 2019, 8), and encouraging students to think critically in new ways. Fletcher and Cambre (2009) argue digital storytelling engages students "in a form of learning that is categorically different from traditional written work" and that the experience generates "complex intellectual engagement" (111) in students.

STUDY CONTEXT AND METHODS

The case studies below discuss three approaches for blending disciplinary knowledge with digital skills to foster authentic learning through scholarly digital storytelling. The authors present the results of independent SoTL research on student learning across disciplines, national borders, and teaching contexts. Research for the US case study was deemed exempt from the university's ethics review board, whereas research undertaken in Norway and Northern Ireland was approved through the relevant institutions' ethical review processes. Data for the case studies was collected between 2016 and 2020. Written consent was secured from all participants in each study. Qualitative research methodologies were employed, including semi-structured interviews, open-ended survey instruments, focus groups, and analysis of reflective elements of coursework and the scholarly digital stories themselves. Data collected by each author was transcribed, coded, and analyzed using thematic analysis.

Schrum interviewed 32 students, close to half of whom have taken her scholarly digital storytelling course over the past decade. The participants were graduate students from several humanities and social science disciplines. All interviews were conducted after final grades were submitted. In addition to semi-structured interviews, participants' coursework was reviewed, including project updates, final reflections, and final projects. Majury collected data from undergraduate students who completed a civic engagement capstone project that required the development of an open access digital story map. Anonymized, open-ended surveys were conducted at the beginning, mid-point, and conclusion of the course; focus groups held; and reflective assessments and story maps analyzed. The

surveys captured the experiences of three cohorts who took the course (48 students in total), 42 percent of whom also took part in focus groups. Everyone who participated in the research majored in geography, a program that pools together humanities-facing and science-facing courses. Finally, Simonelli conducted individual interviews with undergraduate and graduate students who participated in the development of Peer Video Tutorials (PVT) for two biological science courses. Evenly split among undergraduate and graduate students, the 12 participants in the research represented 67 percent of the undergraduates and 38 percent of the graduate students who took part in developing PVTs.

CASE STUDY 1

Scholarly digital storytelling with graduate students at a large research university in the US

Schrum teaches an interdisciplinary, graduate course on scholarly digital storytelling at a large research university in the US. The course focuses on academic research, digital skills, and the craft of storytelling in roughly equal parts. During a 15-week semester, each student individually created a 10-minute digital story, which is the major course assessment. Schrum, who is also the researcher, has taught this class five times in the last decade. During this period, as often happens in SoTL research (Bass 1999), Schrum began to ask questions about the learning that was happening and began a formal SoTL project in 2018.

Digital stories reflect scholarly practice as defined by each student's discipline. Higher education students, for example, address a central problem or question grounded in contemporary theory and practice, such as active learning classrooms or holistic application review. History students integrate primary and secondary sources to present an original argument about a historical topic, such as the lived experiences of an enslaved midwife or the treatment of Filipinos in the US Navy over the past century. For all students, content should be engaging and relevant for their intended audience. Additional requirements include a compelling narrative, smooth transitions, and quality images and audio.

This assessment is, by design, an authentic learning project and Schrum examined student responses to the complex, substantive, ill-defined nature of the assignment (Herrington, Reeves, and Oliver 2005). This is relevant for all aspects of the project, including the digital skills and competencies students develop over the course of the semester. Belinda, a doctoral student in higher education, said in an interview:

> *This was the most challenging and most rewarding class I've taken. It was very hands-on, which is not something that we've typically done in any of my classes. So to work on one project and see it evolve each week, for me, that was so rewarding. To have something tangible at the end and something I was really proud to share—this is the biggest thing and the thing that I have been the most proud of . . . I really love what I did.*

Keith, a history master's student, echoed a similar sentiment in an interview:

> *So the real strength of my project was doing something big and hanging onto it and making it through it. And incorporating the things as you go . . . I forget how many iterations that I had*

of it, but it must have been eight or nine major changes in it. And even when I was done and ready to turn it in, I was still making tweaks.

Both students referenced the complexity and substantive nature of their digital stories, from the uniqueness of having a significant "hands-on" component to the "many iterations." While non-digital projects can be iterative, it is a core component of digital projects that is built into the structure of the course.

Other students commented on the intellectual freedom they found both stimulating and intimidating. Several recalled that this experience opened new paths to learning and reshaped their approach to scholarly work. Tracy, a history master's student, shared in an interview that "you're not hemmed in by questions somebody else is asking. You're able to consolidate your learning . . . it really gives students more voice and therefore more incentive to be engaged with what they're doing." Lauren, a graduating higher education master's student, similarly found this experience novel and empowering as discussed in an interview:

I think I really got comfortable in this class with the freedom to tell my own story . . . I sort of had to create it and make it be what it is. In all my other classes there was a strict rubric—you follow these things, you talked about these points but, for this . . . it was really up to me to decide what was important and why I should tell that story, that kind of thing. I think if I'd had this class, taken this class earlier in the program, I wonder if I would have gone in other classes feeling less bound by the information that's already at my fingertips because I think this sort of forced me to create that information.

For Taylor, a history master's student, the experience caused them to rethink their discipline as explained in an interview, "What are we saying historically? What are we doing historically? . . . One question leads to 10 other questions. And somewhere in there, you find the thing that you really want to do."

Students connected these experiences directly to the digital nature of the project as they learned to communicate research in a new format. Ken, a history doctoral student, said in an interview that there was

something liberating about creating a history document in digital. Because the rules aren't necessarily fixed. The templates aren't all, almost, ossified. You feel less constrained . . . there's a freedom to experiment and to take a chance that I don't think you feel when you're writing a research paper. And maybe it's a little easier to try and find your voice.

The project is carefully scaffolded throughout the semester, but as with many authentic learning projects, students quickly learn there are no simple or correct answers at any stage in the process. In pursuit of the resources needed to create digital stories, students must think creatively and include audio and visual sources often overlooked in graduate programs that prioritize text (Fletcher and Cambre 2009; Gachago, Barnes, and Ivala 2015). Sabrina, a history doctoral student, wrote in a final reflection:

I learned that historical research is not just reading old documents and secondary sources. It is also about looking at all possible types of information in order to create a story. I tried to utilize as many different source bases as I could, since the documentary evidence was fragmentary. I was lucky enough to be able to immerse myself in the environment and use archaeological data, as well as life-size replicas and exhibits . . . original documents and digitized photos of original documents, but I also used digital transcriptions of original documents.

When creating scholarly digital stories, students must resolve complex problems, an essential component of authentic learning (Herrington, Reeves, and Oliver 2005). As with Sabrina's example above, there was not one solution to the lack of documentary evidence. This was an open-ended problem and the resolution came through seeking additional types of sources, specifically content that would help tell the story visually, such as images of handwritten letters or the built environment of a historic site. It also required Sabrina to consider the digital nature of the project and to think carefully about how best to present each source digitally.

Students regularly encountered challenges, both anticipated and unanticipated (Gachago, Barnes, and Ivala 2015; Lombardi 2007). Schrum sought to create a scaffolded learning environment that both supported students in this process and encouraged them to resolve their challenges independently. Karen, a doctoral student in rhetoric, talked about frustrations during the process, such as reworking the script and recording a voiceover that conveyed the research as intended. Karen wrote in a final reflection, "I was getting frustrated with piecing it together in a way that provided the right overview and background but didn't seem separate from the interviews." The deadline approached and Karen "went to bed feeling entirely unsure about how to make it work!" The next morning, however, Karen "woke up with the idea of a more streamlined version" and in retrospect, recognized that they had been "working toward this streamlined version the entire time . . . I'm okay with that because I learned so much in the process." Karen's scholarly digital story included interviews, voiceover, music, images, and video footage, and the process included the challenge of putting these pieces together to tell a scholarly story about mental health in higher education. This intellectual work is fundamentally both academic (how to tell this story) and digital (how to use these tools to effectively communicate the story).

Similarly, Ashley, a history master's student, described the experience throughout the learning process in an interview:

I just think you're more connected to it in the way that you've had to change it more than you would anticipate. With a research paper, you might have to tweak your thesis statement, or you might have to look for more sources . . . But I felt connected to this because a lot of it . . . it will boil down to your decisions and how did you decide to tell the story because it's the story you want to tell . . . I think the decisions as far as how do you develop a topic, what do you include and what do you exclude is huge. It's easier said than done. It's something you learn about in theory in applied history courses, but actually having the hands-on experience of

*conducting the research, the interviews, the things that are important for a video, it's a whole
other experience.*

Natasha, a master's student in higher education, wrote in a final reflection about "struggling" early in the semester "to find the right direction to start in, who to interview, and what would be the primary focus of this story . . . Learning how to tell that story through this process truly became a challenge for me." Through experimentation and reflection, Natasha created a compelling story and reflected in an interview, "I felt better about that final product than any paper I'd ever produced along the way . . . I actually looked forward to going [to class] in the evening because I was really learning a lot . . . those are the things I'll reflect on in 10 years."

This kind of student engagement plays an essential role in the effectiveness of authentic learning, especially in light of the risks students take to define their own questions, learn digital skills, and produce a digital product within a formal learning environment. Students used words such as "frustrating," "overwhelming," "scary," and "terrifying" to describe their feelings during the course. As reflected in the literature, this can be a key part of the learning process (Bass and Elmendorf n.d.; Lombardi 2007). To address this, Schrum scaffolded assignments to slowly build confidence as well as digital and scholarly communication skills throughout the semester, from an initial request to tell a story in 10 images through production of a 30-second trailer for the final project. Students were encouraged to experiment and explore, but they were supported throughout the process with immediate and extensive instructor and peer feedback, ongoing skills workshops, and peer collaboration.

Students remained engaged throughout the semester. While reflecting on their initial apprehension, at the end of the course they also used words such as "proud," "meaningful," "empowering," and "fun" to describe their learning experience. Lena, a higher education doctoral student, shared in an interview, "I can't remember all the classes I've taken . . . but I know exactly everything I did for that story. And when I ended, I was so proud of that story. I still show it to people. It's been almost two years and I still show it to people." Brooke, a history master's student, reflected during an interview:

*Yes, it's being graded. But I think at the end of the day, you forget that it was graded because
you were having so much fun doing it . . . it's just a weird feeling that you just don't have with
other classes. It's like pressure lifts in this class.*

During the course and follow-up interviews, students reflected on the ways in which digital storytelling challenged their thinking about academic work and scholarly communication. They grappled with complex problems and experienced frustration with questions that had no predefined answers, but they also discovered their ability to work through challenges, take ownership of the process, and find their scholarly voices. The stories emerged from their own research interests and they created authentic academic digital projects to share beyond the classroom. The final digital stories vary in quality, but they all reflect significant effort and growth. The data indicates this experience promoted authentic learning as students vividly recalled digital and conceptual details of their projects and conversations with classmates years after completing the course.

CASE STUDY 2

Immersive digital story maps to present undergraduate research at a large research university in Northern Ireland [UK]

Majury teaches a final-year undergraduate capstone course at a large, public university in Northern Ireland. The course provides students with an opportunity to demonstrate how the knowledge and skills they have acquired as geographers can be applied to pressing societal issues. The course is delivered in partnership with local government, community organizations, and a range of charitable initiatives that identify projects they would like students to research. Students—working in teams—research, design, and deliver interactive digital story maps that collate, organize, geo-reference, and visualize their project findings. The digital maps are structured around a series of narratives and tied to place and scale, which enable evidence and argument to be assembled and placed in both local and wider contexts. For example, the merits of a proposal for shared community infrastructure at a particular location can be cross-referenced to supporting evidence, bringing into dialogue micro and macro scales of analysis. The result is an immersive digital resource, which offers students scope to be creative in the geographic referenced data (e.g., statistical, textual, visual, auditory, and even simulated) they embed within their story maps. For students, digital story maps offer the potential to pull together connected narratives at different scales of analysis. For civic partners, the digital story maps offer an immersive, interactive, structured, evidence base to share with stakeholders and inform policy decisions.

Past projects reflect the breadth and diversity of a geographic education. The digital story maps produced for these projects were designed, piloted, and refined in an iterative manner with particular audiences in mind. Students working with the Belfast City Council on modelling flood events and their mitigation, for example, produced a series of animated simulations, linked to modelled data, for a professional audience of planners, engineers, and elected representatives. The team that mapped community-led urban regeneration initiatives in South Belfast designed their digital story map to engage with not only a professional audience, but also a diverse range of local community groups. This approach represents a step change for most students long accustomed to producing assignments with only one audience in mind, that is, the academics who teach them. Consequently, students initially discussed the task as somehow "more real," "scary," "nerve wrecking," and "pressured." This reflected both the nature of the intended audience (external) and the medium of the output (digital story map).

For example, Niamh remarked that the digital story map was "not just another assignment." Presenting it to members of Belfast City Council was "more realistic than *just* doing a class presentation" (Niamh's emphasis). The stakes were somehow perceived as higher than for assignments produced for other courses (Herrington 2015; Littlejohn, Beetham, and McGill 2012). This pressure, at times, seemed overwhelming for some students. Self-doubt, lack of confidence, and fear of the unknown were commonly reported. However, the iterative, incremental nature of researching and developing a digital story map offered scope to scaffold regular structured opportunities for reflection, self-evaluation, mentoring, and additional tailored support. Typically, this meant contact hours were front-loaded for academic mentors, contingent on the dynamics within each project team, and tapered off gradually as students gained experience, negotiated challenges, developed greater resilience, and recognized the potential of peer support within their teams. Delivered in this way, each cohort of students included in this study successfully completed the course.

Students' anxieties about the intended audience are often intertwined with concerns about the nature of the output, a digital story map. The accessible, distributed nature of the output and its use beyond the course produced within the minds of most students a sense of "added responsibility." Until this point in their academic careers, most assignments students submitted were graded, returned, and archived. The digital story map, from the outset, was framed differently. It was a resource to be developed, refined, and then launched into wider circulation. Given this, opportunities were embedded within the course for students to test their ideas and pilot "beta versions" of their story maps with end users. On one such occasion, a team's presentation at a community forum degenerated into a heated discussion between political representatives, keen to air long-standing grievances. For the students, this challenging experience offered valuable insights on the variety of perspectives at play, the ill-defined and complex nature of the problems they were examining, and how best to adapt their expertise to the contingencies of real-world contexts. All of this, of course, was not necessarily self-evident at the time, but required a commitment by the academic mentor to brief, debrief, and follow up on the contingent, cultivating among students the means and wherewithal to work comfortably at the edge of their competence and experience.

The open-ended nature of digital story maps was often described by students as "a challenging new way to work" that was "very hands on." Caoimhe, for example, highlighted "the stress of dealing with unexpected frustrations," such as working out how to layer data within a coherent narrative, reconciling inconsistencies in data sets, technical mishaps, delays in people responding to requests for information, or schedule clashes among team members. For Caoimhe, collaborating with team members and others demanded an emotional investment beyond that typically experienced in other courses. This she qualified, noting, "In a positive way, seeing [the frustrations] as challenges, motivated me to use my initiative under pressure so we could still deliver when things don't go to plan."

This said, devising a plan for most was less than straightforward. The open-ended nature of digital story maps offered students greater scope to experiment with integrating and synthesizing a wide range of source materials, wider than typically required in other courses. Within the layers of a digital story map, digitized materials can be assembled and re-assembled in a dynamic fashion, allowing opportunities to think creatively about juxtaposition of different sources of evidence in crafting arguments. In this way, digital story maps encourage students to think more flexibly about problem solving. At the same time, piloting the prototypes with end users foregrounds the collaborative, participatory facets of knowledge construction for the students. Many likened this to a "real experience of the working world." Aoife commented, "It helped me better understand my identity as a geographer, that is, the skills, insights, and understanding I can bring to problem solving. At the same time, collaborating with my teammates and Belfast Hills Partnership gave me a practical understanding of professional ways of working." Anna, in the same focus group, added, "it helped push me out of my comfort zone and prepare me for the world of work."

The collaborative, iterative process by which students worked on their projects—creating, sharing, and building knowledge—was described as "producing useful work," "doing something practical, beneficial," and "making a difference." Adapting their knowledge and skills to create an accessible, distributed digital resource engaged students personally, as well as intellectually. Meabh commented, "I gained an appreciation for the work others do across the city" and became more aware of "the issues faced by people within my own and neighboring communities." For Leo, producing the story map forced him to

move "outside of personal comfort zones" and confront sources of unconscious bias. "Working with people from a range of backgrounds unlike my own," Leo noted, forced him to engage with multiple perspectives. Where he initially held "an expectation of hostilities . . . these perceptions soon changed" as he realized he "was largely ignorant of the everyday problems which people living in these areas faced." Leo and Meabh felt personally challenged working on their projects, strengthening, in Meabh's words, "my awareness of my responsibility as a citizen." Sharing their work with authentic audiences generated for many the sort of complex intellectual engagement that Fletcher and Cambre have characterized as "at once creative, socially oriented, and pedagogical" (2009, 111).

CASE STUDY 3
Peer video tutorials at the undergraduate and graduate level in a large, public university and a science research center in Norway

Simonelli implemented a supplemental activity in two different biology laboratory and field classes at the undergraduate and graduate level at a large, public university and a university-affiliated science research center in Norway. Students were invited to participate by creating peer video tutorials (PVT). PVT groups included two to four students each. Video production was organized as a collaboration between students (intra groups) and between students and the PVT team consisting of one faculty member responsible for education and communication (Simonelli) and one faculty member responsible for the technical aspects of video production. The aim of this supplemental activity was to develop and use instructional video tutorials to prepare students for biology laboratory experiments and for practical lessons in the field.

Together, the course instructors and Simonelli developed questions related to class content. Each group of students involved in the PVT activity received a broad question, but the assignment was open ended by design. The process subsequently included four steps: script writing (approximately 10 days), filming (up to one day), video editing (up to three days), and reflection (a two- to three-hour session). The PVT-team guided students throughout the production process. There were two explicit requirements for the project: 1) students had to identify and then clearly convey a message related to course content, and 2) the PVT could be no longer than four minutes.

For the undergraduate students in spring 2016, PVT was an optional activity within a required, 15-week course on organismal biology. The course provided an overview of the origin, systematics, and evolution of living organisms on earth. The instructor presented general morphological traits in central phyla through lectures and lab sessions, and students participated in classical dissection and microscopy techniques to learn the morphological structures and bio-systematical details of selected plants and animals. In this class, nine students volunteered to participate in the PVT activity in lieu of one written report.

In fall 2016, PVT was a mandatory component for a 15-week field course on Arctic ecology and population biology. The course explored the ways in which the Arctic environment shapes ecological processes and evolutionary adaptations, including behavioral ecology, life history adaptations, population dynamics, and species interactions. In this class, 16 graduate students, divided into four groups, participated in the PVT activity along with their field work and hands-on learning.

The PVTs students produced were designed to be shared with other students in the class as learning material and by instructors as teaching material in the two original courses. The students creating PVTs were aware throughout the process that the PVTs they created would be teaching other students and could impact their learning and success. For students in this study, this often presented itself simultaneously as both a source of stress about these real-world applications and an extra motivation to, among other things, be as accurate as possible in presenting content. The design approach for learning here engages students with an authentic audience other than the teacher. As Bass and Elmendorf (n.d.) discussed in their study on social pedagogies, students during the PVT activity seemed to value the process and product of learning, which creates opportunities for them to engage with authenticity and difficulty. Individually, students expressed the challenge of making decisions about what to include in the PVT and how best to communicate the content and their message.

Ultimately, the difficulty seemed to lie mainly in the concern students expressed about the quality of their final product. Students felt the responsibility to develop something that had "to be decent enough to look at," as Torvald said in an interview. Mette commented that, "A lot of students hopefully will be looking at [the PVT] and if there is something wrong about it, I'm responsible for providing information to a bunch of students that isn't correct." Mette continued, "I feel like that's probably the worst thing you could do." Students reflected at the end of the activity that they had engaged in the process drawing on "that sense of responsibility," which led them, as Gunn noted, to "take more time to explore how to research things more specifically." Students reflected their level of engagement throughout the PVT process, making a point, as Gunn stated, to "take it seriously, to put more time and effort into it, to stand by the work a little bit more."

Collaboration, another key element of authentic learning, can be challenging for students, especially when creativity is part of the assignment. Each group had to decide collectively how to create their PVT. They faced difficult choices and did not always agree on solutions. Each student had to decide whether or not to defend their idea or approach, and equally important, how to listen to the ideas of other students. Merete commented on the very real experience of producing an authentic academic digital project within a short timeframe: "I was taking pride in the idea that I think I can listen pretty well," but the reality of the collaboration made her think more deeply about her own contribution and process. She explained, "I think, unless you are in that situation where you have a deadline and you really need to push something out, that's when that whole idea of yourself sort of get[s] tested." This student confessed during the interview that she was not as good as she thought at listening to the ideas of others. She found it challenging to defend her ideas at times and to give up on her ideas at other times. These peer relationships seemed to motivate students to deepen their knowledge and gain confidence in their own understanding of content and presentation.

Other students reflected similarly on their own strengths and weaknesses as experienced during the PVT production process. Øystein noted that collaborating to reach an agreement could be very challenging. He described in an interview that at one point in the process, "I was like, 'no.'" In other moments, Øystein found it possible to just "listen and then maybe explain why I don't find it a good idea," or to say, "yes, that is actually a good idea and finding out that pushing my idea forward is not always the best thing to do." Students reflected in interviews that during the activity they learned to listen, to advocate for their point, and to negotiate solutions. In some cases, the outcome involved careful

compromise, while in other groups, students experimented with various approaches to navigating group dynamics within a tight timeframe. Lise remembered saying, "Let's just do it your way. Let's see how it goes, and if it doesn't work then we do it my way." At the end, Lise felt they "really have worked well together towards the end of the activity," and they appreciated "that it was [their] project, a combination of someone pushing your ideas forward."

Students reflected on the real-world relevance and the team aspect of the PVT activities as essential components of authentic learning. These skills are highly valued in a collaborative workplace and can only be learned in meaningful ways through practice, such as these students experienced through the PVT assignment. The level of student engagement and time invested in problem solving group differences is not unusual in authentic learning projects.

DISCUSSION

Scholarly digital storytelling incorporates key elements of authentic learning, including tackling ill-defined, complex problems; collaborating with others in the construction of knowledge; working through the politics of representing knowledge for others; ensuring relevance beyond the classroom; and focusing on the learner and their needs (Barber, King, and Buchanan 2015; Herrington 2015; Herrington, Reeves, and Oliver 2005). Integrating these elements with carefully structured digital assessments creates the potential for "transformative pedagogy where the object is authentic student learning" (Bozalek et al. 2015, 237). According to Bozalek et al. (2013), this approach is "symbiotic, rather than a simple cause-effect relationship between emerging technologies and . . . learning approaches like authentic learning" (637). The digital medium grants certain affordances that more traditional types of academic assignments cannot accommodate, offering scope to incorporate a greater variety of types of media into the stories told, to experiment creatively with different ways of representing knowledge to an audience, and to forge connections with communities beyond the classroom.

Core similarities in these case studies demonstrate the potential for student learning through authentic academic digital projects such as scholarly digital storytelling. In the first case, students created a 10-minute digital story based on their individual academic research for an external audience. In the second, students created digital story maps for civic organizations to address existing problems. In the third, students created peer video tutorials to enhance student learning and engagement with laboratory and field work experiments. In each case, students were tasked with translating disciplinary-based expertise to ill-defined, novel contexts. Once familiar rules of engagement with academic assessments no longer necessarily applied, students focused on communicating with different types of audiences and in digital formats. This provided opportunities for students to take a greater degree of ownership of both the process and the product, offering them the scope to be more creative in how they constructed and represented knowledge to others. In all of these cases, students gained self-understanding, their ability to take account of multiple perspectives, and their confidence to work at the edge of their competence and experience.

This supports findings by other scholars on the potential for authentic learning through scholarly digital storytelling. These assignments provided opportunities for students to "express their voice with intellectual depth in a form other than writing" (Oppermann 2008, 178). Gachago, Barnes,

and Ivala (2014) discussed similar experiences with industrial design students who were motivated by awareness of their peer audience to produce quality content and who expressed both pride in the outcome and an emerging professional identity. Students in the case studies presented here similarly expressed pride in their final digital products, as well as confidence in their ability to overcome adversity and to create something of value beyond a grade. Students' reflections demonstrated the development of essential skills, including "the ability to generate ideas and undertake creative work in digitally enhanced environments" (Lindsay and Wood 2015, 92).

Authentic learning challenges students to use critical thinking and problem-solving strategies (Jopp 2019; Villarroel et al. 2020). Allowing students the intellectual freedom to frame questions and present solutions, as discussed in all three case studies above, enhances student engagement, encourages creativity, and opens up greater opportunity for frustration. This is central in digital storytelling projects where post-production provides "the means by which an argument takes shape and is given form" (Burdick et al. 2012, 14). This mirrors the practice of "generative humanities," grounded in digital humanities, where students create digital projects beyond texts (Burdick et al. 2012, 10). In the cases discussed here, students defined and then grappled with difficult problems. They expressed frustration at the lack of clear, finite answers and the challenges of collaborating to produce quality content on deadline. After completing their scholarly digital stories, however, they often expressed appreciation for the process and the valuable lessons learned along the way. They gained confidence in their ability to resolve difficult problems, and engage as emerging professionals with real problems that exist outside of the classroom walls and they expressed pride in the results.

Research on authentic academic digital projects indicates that students often become deeply engaged in the process. Fletcher and Cambre noted the many hours their students spent creating, revising, and editing their stories, "they say that they lose all sense of time when they are working" (110). The authors of this study observed similar behavior. Students reflected on their determination to create quality, scholarly content as they felt more was at stake with these assignments, motivating them to continue revising and refining toward that end. They used digital tools in an iterative fashion to create and communicate through "pedagogically sound learning experiences" (Alexander et al. 2019, 15).

Teaching with scholarly digital storytelling requires a significant time commitment, motivated faculty, and a willingness to take risks involved in introducing new forms of student assessment. Learning through scholarly digital storytelling, similarly, requires time and dedication from students. These three case studies represent different disciplines, countries, and teaching contexts, but collectively they present strategies and scaffolded approaches for cultivating flexible, adaptive approaches to learning grounded in disciplinary content and digital skill development. Examining evidence across these examples demonstrates the potential for scholarly digital storytelling to promote authentic learning as students imagine, research, negotiate, and produce digital projects.

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Kelly Schrum is an associate professor of higher education at George Mason University (US).

Niall Majury is director of education and senior lecturer at the School of Natural and Built Environment at Queens University (UK).

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ETHICS

Research for the US case study was deemed exempt from the university's ethics review board, whereas research undertaken in Norway and Northern Ireland was approved through the relevant institutions' ethical review processes.

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