IJeP International Journal of ePortfolio

A Publication of the
Association of American Colleges and Universities

Affiliates of the *International Journal of ePortfolio*

Association for Authentic, Experiential and Evidence-Based Learning (AAEEBL)
ePortfolio and Identity Conference

Manuscript Review Board

Instructional Articles

Assessment Article

Book Review

Reflecting, Integrating, and Communicating Knowledge Through ePortfolios to Increase Civic and Scientific Literacy

Theresa Conefrey
Santa Clara University

Davida Smyth
*Eugene Lang College of Liberal Arts
at The New School*

Many students view their classes as separate and disconnected from each other and their lives beyond the classroom. Additionally, STEM students may fail to understand how concepts and formulas of introductory classes relate to practical applications of upper-division coursework and may perceive required general education courses as even less relevant. We suggest that implementing ePortfolios throughout students' academic programs can ameliorate this curricular fragmentation by bringing coherence and cohesion. Using their ePortfolios, students can reflect on connections between concepts and content inside and outside their major as well as other high-impact practices such as undergraduate research and intensive writing. Using examples drawn from the natural sciences and humanities, we demonstrate how ePortfolio pedagogy can help integrate curricular knowledge into solutions for authentic, real-world STEM problems to increase student motivation and understanding of the applications of their learning. Furthermore, it can help students develop the critical thinking and communication skills necessary to share their learning with a wide variety of audiences including instructors, program assessors, potential employers, and community members. Finally, we discuss how ePortfolios have the potential to enhance students' digital citizenship and civic scientific literacy to foster civic engagement upon graduation.

College students are facing increasing pressure as tuition costs continue rising and the future of work remains uncertain. In the age of automation and a knowledge-based economy, research suggests there is no longer a direct correlation between particular majors and specific careers but, rather, employers who are looking for intellectual agility, people who can adapt and evolve. To succeed in the workplace, graduates must be capable of taking initiative, working collaboratively, solving capacious problems, and transferring skills from a familiar to a novel domain (Dorman & Brown, 2018; Hood, Holtzman, & Abbott, 2019; National Association of Colleges and Employers [NACE], 2019; National Leadership Council For Liberal Education and America's Promise, 2007; World Economic Forum, 2016). However, educators and employers are finding that graduates struggle to integrate their learning across the breadth of their courses and over time. While their resumes list their course work and co-curricular activities, students fail to articulate how their education translates into workplace skills that could be applied in future careers. At interviews, even high-performing students with a lengthy list of relevant extracurricular activities are hampered by an inability to explain clearly how they meet the employer's needs and expectations, or to demonstrate what NACE (2019) has defined as *career readiness*, "the attainment and demonstration of requisite competencies that broadly prepare college graduates for a successful transition into the workplace" (para. 3), and what the Association of American Colleges and Universities labels *essential learning outcomes* (Hood et al., 2019).

Our students' difficulty in being able to abstract transferable skills from their coursework is rooted in our current higher education model, which fragments the curriculum. Instead of viewing their academic programs holistically and understanding how skills such as critical thinking and written communication are practiced throughout the curriculum, students tend to view their classes in different programs across the college as discrete and disconnected from each other, so that quantitative skills, for example, are seen as the purview of math courses and writing is of English classes. A consequence is that STEM majors in first-year composition who complain that general education requirements squeeze out more relevant courses may struggle later in their academic careers to complete an adequate literature review, structure their senior design capstone reports, or create an effective resume and cover letter. This disconnect is prevalent even within courses in the major. Incoming STEM students may not understand how the concepts and formulas of introductory classes relate to the practical applications that they will learn about in upper-division courses. If students fail to integrate these foundational concepts and their learning across general education courses, they may switch out of STEM fields or persist but struggle in later coursework and flounder on the job market because they are unable to map their learning onto skills sought in the workplace.

As biology and English professors, we suggest that implementing ePortfolios throughout STEM students' academic careers can help mitigate curricular fragmentation, encourage more integration of high-impact practices (HIPs) and ease students' transition once they graduate. Both our ePortfolio assignments use writing and reflection as tools for improving written communication and as tools for learning and discovery. Rather than linking liberal education solely to vocational ends, we

believe that ePortfolios can foster intellectual growth, creativity, and civic engagement as well as marketable skills. We suggest that ePortfolios, when done well, can help students develop the cognitive awareness necessary to integrate their learning throughout their academic program and their extracurricular activities. Building an ePortfolio helps students foster digital communication and develop an intentional digital identity so that they can demonstrate to employers that they possess the most sought-after workplace competencies: critical thinking/problem solving, teamwork/collaboration, professionalism/work ethic and oral/written communications (Blumenstyk, 2019; Hood et al., 2019; McGraw-Hill, 2019; Peck, 2018).

In addition, these same competencies sought by employers and developed in ePortfolio pedagogy can help prepare students for intelligent, responsible and creative citizenship. These include civic scientific literacy: the ability to find, evaluate, and synthesize information about science and technology to make informed decisions as a consumer; as a citizen voting on STEM policy issues and as an educated individual with an understanding of the scientific method (Shen, 1975); and digital citizenship: the ability to engage in online formats respectfully and thoughtfully with those of different beliefs and values to make their voice heard, to evaluate the credibility of online sources, and a basic understanding of social media and how the internet works (Mossberger, Tolbert, & McNeal, 2008). Such skills can help them become life-long learners who contribute their knowledge to their communities, individuals who can synthesize what they learn from all forms of experience to make effective connections between theory and practice for the increasingly complex issues we face and who know how to communicate effectively with different kinds of audiences.

Reflection and Learning

Concerns over students' abilities to apply fundamental concepts in introductory general education classes to authentic problems in undergraduate research and complex issues discussed in upper-division courses in their major are not new. As institutions began grappling with how to better prepare their graduates to work on open-ended, multi-layered, interdisciplinary problems in the real world, it became clear that the ability to integrate one's learning was more essential than ever. In the early 90s, as higher education think tanks and task forces were being formed to explore the skill sets needed for ever-more technologically sophisticated workplaces and increasingly interdependent, global challenges, the importance of integrative thinking to make informed decisions in professional and civic life was already recognized. For example, the Association of American Colleges and Universities published a series of monographs called

The Academy in Transition as part of this effort. As Leske noted in the forward to *Integrative Learning*, "in most fields except education—from the workplace to scientific discovery to medicine to world and national affairs—multilayered, unscripted problems routinely require integrative thinking and approaches" (Huber & Hutchings, 2004, p. iv).

As one of the most effective ways to foster integrative thinking, scholars have focused on reflection. Much has been written about the value of encouraging students to reflect on their learning and teaching them effective strategies for doing this well. Dewey (1933) described reflection as a process of making sense of experience, connecting one experience with another, and anticipating future learning. Similarly, Kolb's (1984) experiential learning cycle identified reflecting on experiences, abstracting knowledge from them and testing these tentative concepts by applying them to novel situations. Bandura (1986) highlighted its importance in increasing self-efficacy, the belief in one's ability to be able to do something that comes from reflecting on past experiences, observing others, verbal persuasion and one's emotional state. Yancey (1998) drawing on philosopher Donald Schön's (1983) concept of "reflection in action" focuses on the role of reflection in enhancing the teaching of undergraduate composition. Similarly, Rodgers (2002), referencing Dewey's writings, stresses the importance of reflection not only for students but also for teachers to understand how and what their students are learning. Activities and incentives to encourage reflection are important practices to foster students' ability to connect their learning across time from discrete assignments in courses within their major and across general education requirements. Students' integration of their knowledge based on reflection also leads to improvements in metacognition and self-regulation, which in turn leads to an increased sense of an academic identity and increased academic persistence (Conefrey, 2018a; Ertmer & Newby, 1996; Pintrich, 2002; Schraw, Crippen, & Hartley, 2006). Although learning and reflection impact one another such that consistent and effective reflection leads to improved learning, the inclination and ability to reflect does not come naturally and instead requires nurturing, prompting, and practice (Douglas, Peecksen, Rogers, & Simmons, 2019; Howitt & Wilson, 2016; Light, Chen, & Ittelson, 2012). Without practice in identifying connections, students are unlikely to view learning in one course as related to learning in another and may fail to realize the built-in scaffolding within a course. Similarly, without encouragement and incentives to reflect on their learning, students are unlikely to practice this skill regularly and consistently well (Harring & Luo, 2016; Watson, Kuh, Rhodes, Light, & Chen, 2016).

ePortfolios Across the Disciplines

While reflection is possible in any medium, the creation of digital tools for reflection and the advent of cloud computing has provided additional affordances for curating various kinds of artifacts and enabled students to reflect anywhere, any time, and on any device. Peet et al. (2011) identified various dimensions of integrative learning that can be developed through ePortfolio pedagogy: the ability to identify, demonstrate, and adapt knowledge gained within and across different contexts; to adapt to different people and contexts to provide solutions; to understand oneself as a learner (metacognitive awareness); and to create an intentional digital identity. In addition, compared to paper portfolios, a potentially transformative aspect of ePortfolios is that they provide a flexible place and space for students to incorporate multimedia, evidence of their learning for themselves and others, and reflections on their learning across courses and throughout their academic careers and beyond (Cambridge, 2008; Chen & Black, 2010; Jenson & Treuer, 2014; Morreale, Van Zile-Tamsen, Emerson, & Herzog, 2017). Compared to other tools and technologies for reflection and integration of learning, ePortfolios also provide the most flexibility in practicing rhetorical strategies for communicating with multiple and diverse audiences and for keeping pace with students' evolving academic careers.

ePortfolio pedagogy also helps with learning how to reflect well (Landis, Scott, & Kahn, 2015) because it provides opportunities for students to obtain feedback on their writing, which is important because deeper reflections are possible when initial thoughts and observations are shared and discussed with others (Yancey, 2009). Where developmental feedback and scaffolding are offered, the quality of students' reflection improves and some reach a level of *integrative meta-reflection*, where they can reflect on their reflections (Schrand, Jones, & Hanson, 2018). In this way, ePortfolio pedagogy leads to students taking more responsibility for their own education and becoming more intentional about how and what they learn, what they share, and who they share it with as they develop their professional, digital identity (Peet et al., 2011).

From the early adoption of ePortfolios in humanities programs that would formerly have used some kind of print portfolio assignment for student assessment, ePortfolios have proven themselves to be more beneficial than print in numerous ways (Yancey, 2009). Research by Bowman, Lowe, Sabourin, and Salomon Sweet (2016) comparing reflections in first-year writing in print and digital formats found that, while reflections in either format improved integrative learning, students using the digital format evidenced increased metacognitive skills and intentional learning.

From first-year writing to courses across undergraduate education to graduate and professional programs, ePortfolios have improved learning outcomes by strengthening integrative learning to connect students more closely to their chosen field (Batson et al., 2017; Light et al., 2012; Reynolds, Patton, & Rhodes, 2014). For this reason, ePortfolios are becoming increasingly common in institutions and programs with capstone requirements. For example, (a) Cordie, Sailors, Barlow and Kush (2019) reported on their use in three different programs at a large land-grant university; (b) Morreale et al. (2017) discussed their usage campus-wide at a large research institution; and (c) Schrand et al. (2018) described their introduction at a small, private university. Similarly, providing evidence from the Connect to Learning project, an initiative comprising 24 institutions, Eynon and Gambino (2017) found that ePortfolios were beneficial across all institutional types and programs in supporting the integration of student learning, development of a scholarly identity, and promoting overall improved academic outcomes.

In recognition of the potentially powerful impact ePortfolios can have on learning gains, they have recently been declared the eleventh HIP (Watson et al., 2016). While ePortfolios alone are beneficial, an increasing body of research suggests that where they are combined with other HIPs, the benefits are cumulative and participating in multiple HIPs is particularly advantageous for first-generation, low-income, minority, and other traditionally underrepresented student populations (Conefrey, 2018b; Finley & McNair, 2013; Kuh, 2008; Reynolds et al., 2014). These findings suggest that an important affordance of HIPs is their ability to promote integrative learning from both academic and co-curricular activities, that is, to help learners "reflect on their understandings, reconcile new ideas with old ones, and integrate learning from one setting to be useful in other settings" (Tukibayeva & Gonyea, 2014, p. 13). Because of their ability to act synergistically with other HIPs to amplify their benefits (Conefrey, 2018a; Hubert, Pickavance, & Hyberger, 2015), some have labeled ePortfolios a "meta-HIP" (Watson et al., 2016).

ePortfolios for Professional/Career Development

In addition to fostering integrative learning, undergraduate programs are also understanding the benefits of using ePortfolios to promote more intentional learning and a professional digital identity. As they progress in their academic programs and curate their learning in ePortfolios, they begin making the transition from viewing themselves as students to imagining themselves as scientists, researchers, and engineers. When this process begins, students start becoming more active participants in their own

educational journeys and taking more responsibility for charting their own life's course. The emphasis on reflection encourages students to reflect on what they are learning in a single course, all the courses throughout their academic careers, and their co-curricular and extra-curricular activities. Students who are exposed to ePortfolio pedagogy early and often in their academic careers come to understand that learning from all these disparate settings can be integrated and applied to novel settings. Jones and Leverenz (2017) noted that students are often more motivated when they realize that their ePortfolios can be used not only to satisfy course requirements but also to showcase their skills for future employers, graduate school applications, or other external audiences.

Part of this process, especially for juniors and seniors, involves students developing a professional identity as ePortfolios provide an opportunity for students to try on new personas, integrate new identities with older ones, decide how they want to present themselves to potential employers, and field test how they are received and perceived by viewers. Presenting themselves in their ePortfolio requires that they reconceptualize their audience as broader than their instructor and classmates and begin to understand how viewers bring their own understandings, experiences, and expectations to the ePortfolio. A well-crafted ePortfolio with effective content can help students fashion a professional identity and combine their academic, co-curricular, and extra-curricular experiences so that an employer can more easily appraise their knowledge and skills (Benander & Rafaei, 2016; Gallagher & Poklop, 2014; Ramirez, 2011). Lynn Pasquerella (2019), President of the AAC&U (Association of American Colleges and Universities), asserted that high-impact learning opportunities engage every student in solving unscripted, real-world problems across all types of institutions and noted that "business executives and hiring managers find ePortfolios containing artifacts of demonstrable skills more helpful than college transcripts and resumes alone when evaluating and hiring recent graduates" (para. 8).

Recognizing the importance of ePortfolios in career planning, some institutions such as Virginia Tech (McNair & Garrison, 2012) and Stanford (Chen & Patel, 2017) have dedicated courses for students seeking to build their digital brand for the job search. The benefits persist whether or not the potential employer reads the student ePortfolio. The exercise of creating it is valuable for interviews because, as Cordie et al. (2019) noted, having created a narrative to organize their ePortfolio, candidates are better prepared to address common interview questions such as "Tell me about yourself?" and "What distinguishes you from other candidates for this position?" The metacognitive

and flexible learning skills that they learn can make these graduates stand out from others. ePortfolios, when done well, provide evidence of the competencies identified by NACE (2019): critical thinking, oral communication, written communication, teamwork, digital technology, leadership, professionalism, and career management. These are skills that employers often find lacking in recent graduates (Watson, 2019; Wear & Baltazar, 2019).

ePortfolios in STEM

Where ePortfolios have been slower to take off is in lower-level and general education undergraduate STEM courses. As a result of disciplinary silos and the need to "cover" large amounts of basic concepts, writing (and reflection) has typically been viewed as the purview of the literature faculty. However, institutions that have begun incorporating ePortfolios into their science courses have found them to be highly beneficial. Singer-Freeman, Bastone, and Skrivanek (2014), who implemented ePortfolios in a summer research program for underrepresented minority students, found that they increased students' sense of academic identity, scholarly community, and future orientation. Their research confirmed that the learning gains were even greater for those traditionally underrepresented in STEM fields, and that the gains could be assessed by both the faculty who were familiar with the students and other faculty who were not (Singer-Freeman, Bastone, & Skrivanek, 2016). More recently, Singer-Freeman and Bastone (2017) found that in a growth mindset intervention (Dweck, 2007), students using digital portfolios acquired greater benefit than those using print portfolios. Similarly, Picardo and Sabourin (2018) found that biology and chemistry majors in a 10-week summer research program reported greater learning gains when they received guidance with reflection and created an ePortfolio to showcase their learning when compared to those in a comparable cohort who did not practice reflection or create ePortfolios. Moreover, the reflections of those in the ePortfolio cohort demonstrated evidence of professional identity development and increased self-efficacy (Bandura, 1997; Hunter, Laursen, & Seymour, 2007). Similar gains in terms of engagement and persistence were found in undergraduate biochemistry curriculum at six campuses that recently implemented ePortfolios (Mills et al., 2017) and in biology courses for majors (Haave, 2016; Johnston, Kant, Gysbers, Hancock, & Denyer, 2014) and non-majors (Fuller, 2017).

As awareness grows of the value of HIPs in improving undergraduate STEM retention, ePortfolios pedagogy is increasingly supported by national science pedagogy-focused organizations such as SENCER (Science Education for New Civic Engagements and

Responsibilities). The use of ePortfolios in undergraduate science courses has been shown to amplify the impact of undergraduate research and promote the SENCER ideals of civic scientific literacy and civic engagement by enabling students to engage with multiple audiences and share their work more easily. Sieg et al. (2019) have previously piloted the use of ePortfolios in biology and physics courses at two different, small liberal arts institutions to showcase and display undergraduate science research and projects connected to real-world problems. For SENCER faculty at institutions that have struggled historically with student retention in STEM majors and lack the resources to fund much undergraduate research, ePortfolio pedagogy appears to increase the benefits of classroom-based undergraduate research experiences (CUREs) and project-based learning (PBL), two options for providing undergraduates with research experience and helping them integrate curricular knowledge into solutions for authentic science issues to improve engagement and retention. In their reflections, students wrote how combining CUREs and PBLs with ePortfolios had improved their communication skills, made the course more engaging and offered greater opportunities for collaboration and interaction with faculty and peers (Sieg et al., 2019). Although it was too early for faculty to assess specific gains as a result of these interventions, they were able to report that more of their students were considering graduate programs, receiving research fellowships, internships, travel awards, and presenting at national conferences. Similarly, KEEN (Kern Entrepreneurial Engineering Network), a national engineering-education association has recently established a Subnet in 2019, called LEARN (Learning Through Evidence-Based Authentic Reflection and Networking), where members share best practices for using ePortfolios in undergraduate engineering courses. Their annual meetings also feature an increasing number of presentations by faculty piloting ePortfolios with the goal of using them as a curriculum-wide approach to develop an entrepreneurial and professional mindset in engineering students.

Ideas for Getting Started if You are New to ePortfolios

Faculty who are new to ePortfolio pedagogy and whose institutions lack top-down support might consider adding ePortfolios to their courses by adapting existing assignments rather than trying to make too many changes at once. For example, print-based reflection assignments could be assigned in a digital format with the added advantage that students could include multimedia in their responses, discussion posts could be assigned as blogs with students commenting on each other's posts, and digital stories could easily be uploaded to portfolio platforms. New ePortfolio adopters should be aware, however, that there can be challenges with students'

motivation and confidence in using their ePortfolios. Douglas et al. (2019) found that seniors and those who had prior experience with ePortfolios tended to make better use of their ePortfolios than juniors and those who were less experienced with the technology. Other concerns include platform choice, adequate training for both faculty and students in technical aspects of creating ePortfolios, and privacy issues (Eynon, Gambino, & Török, 2014). In addition, to be the most effective, ePortfolios must be implemented well and should evidence the eight qualities that Kuh and O'Donnell (2013) have listed: (a) high expectations for quality work, (b) significant investment of time and effort by students over a period of time, (c) frequent feedback on work in progress, (d) meaningful interactions with faculty and peers, (e) opportunities to reflect on and integrate learning, (f) opportunities for experiences with diversity and real-world applications, and (g) demonstrations of competence for external audiences. Integrating ePortfolios across the disciplines and throughout students' academic careers is the ideal way to maximize their synergistic potential and to enhance their use for academic advising (Ambrose, Bridges, Dipietro, Lovett, & Norman, 2010), and assessment. Currently ePortfolios can be used for program assessment and accreditation in many fields by using AAC&U's VALUE Rubrics (Rhodes, 2014); however, available rubrics work less well for STEM disciplines such as Biology.

ePortfolios can be slow to take off institution-wide as it takes some trial and error to sell them to colleagues and students, and it may also be helpful to join national associations which promote the use of ePortfolios across the curriculum in undergraduate education such as AAEEBL (Association of Authentic, Experiential, and Evidence-Based Learning) and AAC&U. Additionally, as noted above, some national science education associations such as SENCER and KEEN have subsections devoted to educating and informing members about ePortfolio use in STEM fields. Other valuable resources include journals such as the *International Journal of ePortfolio* (IJeP), the *AAEEBL ePortfolio Review* (AePR), and other occasional publications from the AAC&U focusing on ePortfolios. Comprehensive guides from leaders in the field (e.g., Batson et al., 2017; Eynon & Gambino, 2017; Light et al., 2012; Reynolds et al., 2014) are also invaluable.

Case Studies: ePortfolios to Promote Civic and Scientific Literacy Across the Disciplines

As described earlier, a newer but promising area of ePortfolio implementation is in undergraduate STEM pedagogy to increase motivation, engagement and retention of undergraduates in these fields. Drawing on examples of student ePortfolios from pilot implementations in natural sciences and applied

Figure 1

Excerpt from Student Reflection Essay on the Design of a Toilet Demonstrating Integration of Classroom and Real-World Knowledge

Ind 4 – Journal Entry Week 3

Posted on October 14, 2019 / Under Uncategorized

/ With 0 Comments

Two of my grandma's friends who live in the city have this sort of bidet attachment that was added to their otherwise normal-looking toilet. This was the first time I've ever tried a bidet, and I'm not sure how to feel. I understand how much cleaner that is, and really, it does make more sense to wash down there with water, not just some think paper. However, I found it uncomfortably wet afterward. There was a dryer setting that was sort of a light fan, but that made me wonder how clean it actually was, especially if those hand dryers are bacteria-filled as well. So I tried using toilet paper to dry off a bit more, but that also didn't work very well.

Aesthetics- 3 (regular looking toilet, very clean)

Economy- 2 (added bidet seems expensive, the first time I've seen one, and that says something at least about affordability)

Sustainability- 2 (used a lot of water, to clean and to flush, no setting that was less water)

Note. Excerpt from student reflection essay on the design of a toilet demonstrating integration of classroom and real-world knowledge, particularly the statement about potential contamination of dryers by bacteria. This reflection also shows that the student demonstrated critical thinking in their use of the assigned rubric to rank the toilet design.

writing courses at our home institutions, we demonstrate how ePortfolios can be used to integrate other HIPs and curricular knowledge into solutions for authentic, real-world STEM problems to increase student motivation and understanding of the applications of their learning. We provide exhibits from our students' work, showing evidence of student integration, reflection and communication. The examples demonstrate that they are developing the critical thinking and communication skills necessary to connect disparate ideas and to share their learning with a wide variety of audiences

including instructors, as evidence of their mastery of the course goals, and employers as evidence of marketable skills. We suggest that the skills students acquire through building their ePortfolios enhance their civic and scientific literacy to promote life-long, effective, digital citizenship. They graduate with the potential to become informed and engaged citizens who are skilled at using digital tools to research and communicate effectively on science and technology issues affecting themselves and their communities. We round out our discussion by describing some of the challenges associated with ePortfolio implementation, offering possible solutions to mitigate them.

Figure 2
Excerpt From Student Reflection About Toilet Access

Note. By providing students access to data and the means to analyze the data, students are able to think critically about toilet access, actively integrating classroom learning with their real-life knowledge and experiences. Because most students consider toilet access a problem in other countries, particularly underdeveloped countries, which is not something connected to their lives, this activity provides an opportunity for students to reflect and communicate their thoughts and ideas when presented with data from their own states. In some cases, students were shocked when confronted with the data, as is evident in this example.

Figure 3
Excerpt From a Student's Microbial Profile Demonstrating Integration of Classroom Learning With Information Gleaned From Their Independent Research

5/1/2024

Dear Diary,

So let's be candid for a second. We all know there are good and bad bacteria. There are bacteria that provide and support an ecosystem/microbiome, and there are ones that harm those environments. One example of a bad type of bacteria are pathogens.

In layman's terms, a pathogen is a bacteria that can cause disease. You might be asking if *I* am a pathogen and simply put: I am not. Because I am a Vibrio fischeri, I am not really pathogenic. However, my cousins Vibrio vulnificus and Vibrio cholerae are quite nasty pathogens. Cousin cholerae is responsible for making unlucky humans feel very sick. Cousin c. gives them the most unpleasant stomach issues like vomiting, mass-amounts of watery diarrhea, rice-water stools, abdominal pain and even low blood pressure and a rapid heart rate. My cousin sometimes even kills the people that they mess with. Now onto my cousin Vibrio vulnificus, sounds dramatic right? Cousin vulni causes similar symptoms in humans as my other cousin but also causes a rapid decrease in human health with skin and bloodstream infections. Sometimes the humans they infect are smart and take antibiotics which work to get rid of my cousins and make the humans feel better.

There are some bacteria that are antibiotic resistant. This can happen when the antibiotics introduced to the community of microbes only kills off the weak bacteria, leaving behind bacteria that are strong and resistant to that specific antibiotic and can even give their drug resistant DNA to other bacteria via a process called horizontal transfer which is a transfer of genes directly. This leaves only the strong ones to repopulate making a fresh 'batch' of antibiotic resistant microbes. It's a scary thought because this can lead to things called superbugs; which are, in some cases, practically indestructible pathogens.

I hate to leave this entry on a kind of sad note, but next time I promise we will talk about something nicer.

Love,

Ali <3

Note. Student creativity is also evident in the style and use of a diary format to communicate the information in a fun and engaging way. This assignment leverages the ePortfolio to highlight content knowledge, integration of knowledge, linking of learning to real-world issues, and effective and creative written communication.

Eugene Lang College of Liberal Arts at The New School

Eugene Lang College is one of the five divisions that make up the New School, a private institution with a mission to "prepare students to understand, contribute to, and succeed in a rapidly changing society, thus making the world a better and more just place" (The New School, 2020). At Eugene Lang, which has approximately 1,500 undergraduates, students do not declare a major until their sophomore year and are encouraged to sample the varied curricular and cross-disciplinary offerings before they commit to a particular major. As part of a first-year experience (another HIP), all Lang students take a first-year seminar-based course, which features an embedded first-year peer fellow who helps them adapt to and integrate into college life. These courses are taught by a variety of Lang faculty and are not considered to be discipline-focused; rather, they serve to promote student literacy and writing.

ePortfolio usage is encouraged for the first-year students though few of the faculty employ their use in the course itself. This is in contrast to Parsons School of Design where ePortfolios have been embraced as a curricular innovation across 11 of its undergraduate majors. The transition from a paper-based/physical portfolio to an electronic version has been successful in studio classes at Parsons in which "the foundational qualities of art and design practice is innovation and generative thinking" (Doren & Millington, 2019). We noted that the ePortfolio process made visible the art and design practices that are not usually seen.

The Lang freshman seminar course, How the Toilet Changed the World, is the first course offered by a Natural Sciences faculty that incorporates ePortfolios. The assignment is based upon ePortfolio assignments used by Dr. Smyth at Mercy College via Digication in environmental science and microbiology classes (Sieg et al., 2019). In the course, students tackle the topic of toilets, the science behind the invention, the history of the toilet, and how important they have been and continue to be across the world. The course takes students on a journey covering the development of epidemiology and John Snow, gender equity and access to toilets, public health and open defecation, technology, biogas, and the future of toilets. Like the courses being taught at Santa Clara, this course is writing-intensive and features several reading and writing assignments, case studies, games, and lab experiments. It has been deliberately designed to help improve students' engagement with civic issues and problems of real-world import. The course features a semester-long collaborative project that involves designing a more sustainable, culturally sensitive, aesthetically pleasing and affordable toilet. The collaborative project allows students to integrate all of their classroom learning and research outside the classroom to develop a single prototype of the design. They also have the opportunity to research and apply their critical thinking to real world examples (Figure 1) and to reflect upon access and civic issues (Figure 2). Throughout, students reflect upon their learning weekly in ePortfolios and are asked to comment on their peers' work. Using the ePortfolio this way provides the instructor with a pulse on student learning and their reflective process as they journey through their first semester at the college, and encourages students to communicate with their peers and the New School community via the ePortfolio and integrate their prior knowledge with their classroom learning.

In the foundation course Microbial Ecologies, students complete a semester-long research project detailing a specific microbe. This assignment was based upon ePortfolio assignments that were piloted at New York City College of Technology via the OpenLab (https://openlab.citytech.cuny.edu) in microbiology classes

taught by Professor Smyth. Unlike the freshman course, this course serves as a foundation course for the interdisciplinary science major and can also be taken by a variety of students in varying majors from fashion to environmental science to integrated design. The course has no prerequisites. The project is called Getting Friendly with Bacteria and serves to integrate both their classwork and independent research while demonstrating that integration visually and creatively in the ePortfolio (Figures 3 and 4). Students get to choose their microbe and, while a list is provided, students can propose another microbe that ties into their other interests (e.g., microbial pigments, food microbiology). Rubrics and writing prompts are provided based upon the core concepts of a standard microbiology course aligned with Vision and Change. The AAAS (2011) report "Vision and Change in Undergraduate Biology Education: A Call to Action" concluded that a change in how we taught our students was needed. It recognized the interdisciplinary nature of biological research, along with the ever-expanding complexity of biological data, and the associated power of emerging technologies (Horak, Merkel & Chang (2015).

The assignment is scaffolded to ensure timely completion of the task. Examples of previous semester's work are also shown to the students. This assignment has been adapted to the New School by the inclusion of an additional task. Students create a public work that is entirely up to the students' discretion but must feature the microbe from the portfolio. As the creative work is destined for the general public, it must be accessible to non-specialists. Students can write poems, make food, create works of art, knit microbes, and record songs and raps. This Spring we held our first Marvelous Microbes Exhibition celebrating the featured microbes. Each exhibit (e.g., showcasing painting, poem, story) was accompanied by a scannable QR code that linked to the student's ePortfolio. This allowed attendees to visit the ePortfolio and to learn more about the featured microbe.

In all courses where ePortfolios have been used, the feedback has always been positive. From earlier versions of the assignments at Mercy College and CityTech, and in classes such as Environmental Science for non-majors and Microbiology courses for majors, students have always valued the ePortfolio experience. From our pilots at the New School, feedback from students in the end-of-course evaluations and their comments in their ePortfolio reflection assignments suggest that the students appreciated reflecting on their classroom learning in the ePortfolio. A student in the freshman course commented, "I feel that the most effective aspects of the course was completing the journal entries each week. It gave me a space to practice my writing, and also reflect on what I've learned." In the Microbiology course, two students singled out the projects on the portfolio as the most effective activity,

Figure 4

Excerpt From a Student's Microbial Profile Connecting Their Microbe to the Solution of a Capacious Problem, Light Pollution

Sometimes I feel insignificant, I feel like people only know me because of Prymna!! Well, if I am being honest that is the only important thing my family and I have really done so far… but I see a big future for us. I particularly see a future for us in terms of helping or solving the light pollution problem that the modern world has. Speaking of, I'm reading an article right now that is telling me about all the problems of light pollution. They say that "Light pollution is excessive, misdirected, or obtrusive artificial (usually outdoor) light. Too much light pollution has consequences: it washes out starlight in the night sky, interferes with astronomical research, disrupts ecosystems, has adverse health effects and wastes energy." which is absolutely insane (Globe at Night)! I can see us revolutionizing the way the humans light our world. For example, if they can work with us and figure out a way to harness our abilities to provide light to city streets by replacing street lamps with us, then — in theory — light pollution could be addressed and would begin to be dealt with!! Wouldn't that be amazing? The more light pollution there is the worse our planet's condition gets, which sucks because light pollution gets worse and worse worldwide every single day. It is sad. I was doing some research and found a mock up of what a bioluminescent human city would look like and here is what I found!

https://www.cnn.com/videos/tv/2016/10/25/make-create-innovate-bioluminescence-glowee.cnn

Note. In this excerpt, the student is reflecting on the potential of their chosen microbe to serve as a solution to a civic problem. It also shows the student incorporating novel research that was not covered in the classroom. The student is also beginning to recognize and reflect upon the importance of synergy rather than competition with nature.

The debate at the end, the final project, the tour of the school, the continual dialogue about how this could be used in the real world/what is actually going on in the real world. . . . The projects of this course were very helpful and interesting to do such as tiny earth and getting friendly with bacteria.

The integration of ePortfolios into the Microbial Ecologies course is significant as it is a foundation course for our major, one of the five that all Interdisciplinary Science students take. This means that all students in the major will have experience working with their ePortfolios. ePortfolios are now being piloted in subsequent science courses including the intermediate course Evolution, Mutation, Computation with a focus on integration, reflection, and communication of key concepts. A newly developed course, "Building your Career Ecosystem," is focused on developing the career

ePortfolio. By leveraging ePortfolios to not only satisfy course requirements and showcase their research and projects but also to highlight their skills and talents for future employers, graduate school applications, or other external audiences we hope to increase their motivation (Jones & Leverenz, 2017).

It is noteworthy that our presentation at recent conferences of our work in progress, namely at the SENCER Summer Institute in 2019 and the 11th Annual Forum on Digital Learning and ePortfolios in 2020, has led to additional faculty and administrators embracing ePortfolios as pedagogical tools at The New School. Dr. Anne Yust attended SENCER and is piloting them in her math course Quantitative Reasoning, and our Director of Curricular Initiatives has reached out to discuss possible expansion into other courses in other majors.

Santa Clara University

Santa Clara is known primarily as an undergraduate liberal arts institution, although it does have some (mostly professional) postgraduate programs. Regardless of major, all undergraduates must complete the university's core curriculum. However, despite Santa Clara University's (2020) goal to "reemphasize engaged learning, critical thinking, civic life, communication, and intentional learning" (para. 3), many students are unengaged in these required courses, which they believe to be less relevant for their future plans than courses in their major. As a way of encouraging students to make more effective integration across disparate courses inside and outside of their major, ePortfolios offer significant potential. The following section describes how the integration of ePortfolio pedagogy in a core writing course for STEM majors helps students understand the value of their learning beyond the classroom and the importance of developing a range of rhetorical strategies to communicate that learning effectively to both specialist and non-specialist audiences.

The course Writing in STEM focuses on technical writing and formats such as proposals, formal letters, resumes, technical presentations, and formal reports. As students represent a variety of majors and are often reluctant to devote effort to STEM content outside of their own major, the course connects to broader narratives around "fake news" and focuses on STEM issues of widespread public interest. For the major assignment, students research a controversial issue related to their major in both peer-reviewed journals as well as popular, credible media sources such as respected national newspapers and news magazines. Exploring topics such as whether to pay the higher premium for organic produce, drive an electric car, or purchase bottled water, or decide how much

information to divulge on social media, and so on, emphasizes the need to know about breaking news outside their own STEM field in order to make informed decisions for themselves as citizens.

To meet the course goals and build their ePortfolios, students complete several scaffolded assignments. For example, a Blog Post assignment requires them to read and analyze a science-based news article from a respected national newspaper that references published research. They then read the original research before writing a blog post, which takes a stance on how faithfully the news story represents the research findings. Reading both academic and popular sources affords opportunities for analyzing which writing style and rhetorical strategies are used for each audience and for what purpose. This focus on critical thinking and rhetorical strategies sets students up for the major assignment, Controversies in STEM, which is a report on a controversial issue in their STEM field. In preparation for the final written report, students gain practice in a variety of formats such as formal proposals, progress reports, literature reviews, and presentations on relevant peer-reviewed research on their topic to their classmates, a non-specialist audience. Students' oral communication skills culminate in a presentation to demonstrate the major findings of their final report, which can be uploaded to their ePortfolio. To anchor their ePortfolio, students also write a reflection essay as the final written assignment. In completing the reflection essay, they are tasked with reflecting on how their assignments relate to the course learning goals and objectives. The reflection prompt is as follows:

> Describe what you have learned about writing in STEM. Possible questions that you could address include: What do you know about writing in STEM for different audiences and with different purposes that you didn't know before taking the course? What have you learned about locating and evaluating sources and selecting credible ones to provide evidence and elaboration for your ideas? How does what you have learned in this course relate to other classes that you are taking at Santa Clara University or your life in general? For each claim, provide evidence and support which can be text-based, graphics, video, or multimedia.

The excerpt in Figure 5 is sampled from the reflection essay of a computer science major who, in describing what he learned about how to critically evaluate different kinds of STEM sources, demonstrates he applied the learning objectives of the class to his project on self-driving cars and how that knowledge can be valuable in a broader sense.

Other students also mentioned their increased awareness of how the audience shapes the text and how an alert reader must consider the motives of the writer.

Figure 5
Excerpt from Student ePortfolio With an Oral Presentation Slide and Reflection Essay
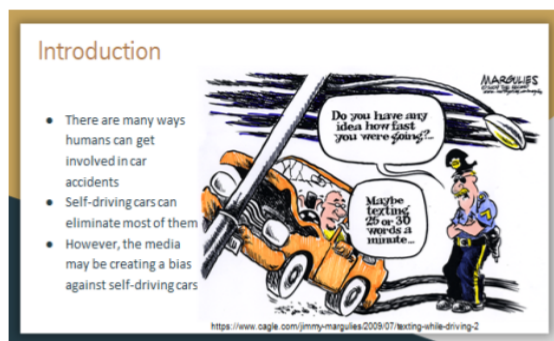
I have learned that it is very easy for technical information to be misrepresented when presented to lay audiences. This means that the general public tends to receive a sensationalized, shallow perspective on a highly technical and nuanced topic. For example, an article I read for our report provided information on the crash statistics of self-driving cars. However, it only included the number of crashes, not the frequency of crashes. As a result, it made the companies which had driven the most (Waymo and Cruise) look like they also crashed the most frequently, since they had the highest number of crashes. However, this is not true; because they had driven the most miles, it was no surprise that they would have crashed the most.

I also learned that technical articles can have their own form of bias. This is because sometimes companies commission researchers to write scientific articles for them about their products. Because these researchers are being paid by the company, they want to present the company in a favorable light. For example, while doing research on self-driving cars, I discovered that many reports on the safety of self-driving cars were commissioned by Google or other self-driving car companies. This meant that these articles focused on the positive sides of their self-driving cars, possibly misrepresented their crash statistics, and did not provide a completely objective analysis of their safety. For this reason, I realized that I also needed to investigate the researchers' backgrounds and their motives for writing the article. While working on the report on self-driving cars, I read many media articles and compared their content to corresponding content in scientific articles.

Apart from a healthy skepticism of the media's interpretation of peer-reviewed science and increased alertness to the existence of fake news, some commented on how creating the ePortfolio helped them begin preparing for future careers and lives as engaged citizens. For example, a student majoring in public health wrote,

> I am especially grateful to this class for the opportunity for modeling an in-depth examination of how media sources maintain fidelity to scholarly research. As I prepare to enter the healthcare industry as a research scientist, I am increasingly concerned about the lack of information and misinformation presented in non-scholarly sources about topics like vaccination, dieting, prescription drug use, insurance practices, and self-diagnosis and treatment of mental or physical illness. I firmly believe that scientists have the responsibility to not only carry out robust and replicable studies but also to make sure that well-researched science is communicated outside of the bubble of academia and into the public realm in a way that is understandable and accessible.

Emphasizing not only the value of science information being conveyed accurately and effectively to the public, other students mentioned the importance of selecting appropriate rhetorical strategies for communicating effectively with decision makers. For example, one student noted,

> As public health practitioners, we not only have a duty to educate the public (think nutrition, vaccines, sexual health), but the level at which we are able to make our case to people like lawmakers has the potential to shape legislation and impact health policy on a national scale.

As students begin populating their ePortfolios with their blog posts, written reports, and reflection essays, they may choose to add additional content such as their oral presentations, resumes, professional photographs, and sample assignments and projects from other classes. In addition to the Welcome page, which describes the purpose of the ePortfolio, students also create an About Me page after careful consideration (and in-class discussion) of how they want to present themselves digitally. In this way, they bring the same rhetorical awareness to their ePortfolios as to their other assignments, so that by the end of the course, students have created a personal website that is accessible to a

Figure 6
Example of a Student ePortfolio With Links to Projects in Other Courses

variety of audiences as shown in Figure 6. Those who added additional content to their ePortfolios from other courses commented that their ePortfolios could be useful for advising and preparing for internships and other extracurricular opportunities. Displaying advanced digital skills and rhetorical awareness of employers, a computer science major who was interested in both programming and graphic design opportunities wrote about how she needed to need to write different versions of her resume to target different positions and how it was also appropriate to offer different versions in different formats on her ePortfolio:

I iterated it a couple of times over the course of two weeks with the help of a few people in addition to the advice and tips given by the in-class speaker. In the end, I settled with two different designs that I am currently using for jobs that are more art focused and ones that are more programming focused (on my website, the CV page has the simpler one printed directly on the page and has the more in-depth version to download). I think they're both vast improvements over my previous versions; they're less bogged down by text and formatted for easier scanning. While they both deliver essentially the same information, each one caters to what might be expected per field.

Many seniors noted that with some modifications, such as including projects from their majors, their ePortfolios could be used to showcase their career readiness skills to potential employers to prepare for interviews even if the prospective employer did not visit their site. See Figure 6 for a sample page from a computer science major who demonstrates effective visual rhetoric and digital skills by providing a brief description of some of his projects and links for the viewer to explore in more depth.

Discussion

Our examples show how ePortfolios across the disciplines have been used at two very different programs at two very different institutions to strengthen students' abilities to apply what they are learning in their courses to authentic, real-world STEM problems such as toilet access in developing countries and in the United States, the impact of light pollution, and the so-called risk of autonomous vehicles, thus improving their civic and scientific literacy. As seen in our examples, students are using their ePortfolios to integrate curricular knowledge into solutions for authentic real-world issues and reflecting on how to communicate these issues to a variety of audiences. Such problem-based learning increases student motivation and understanding of how their learning could be used in future careers and applied to their lives as informed citizens. The exhibits from the ePortfolios demonstrate how students are developing the critical thinking and communication skills necessary to synthesize disparate ideas from undergraduate research lectures, course texts, peer-reviewed journals, and multimedia sources accessible to the public and to connect that learning to future careers. In creating these outward-facing ePortfolios and related exhibits, we have shown how students are practicing their oral and written communication skills in a variety of modes to share their learning with diverse audiences such as (a) to instructors, as evidence of their mastery of the course

goals; (b) to employers, as evidence of marketable skills; and (c) to general audiences such as family and friends, as evidence of how their academic learning connects to real-world applications. One of the benefits of ePortfolios is their capacity to encourage communication with different audiences. With the adjustment of settings, content can be delivered within the classroom or to the general public. A variety of platforms are available with different levels of support.

The potential benefits students acquire by creating their ePortfolios extend beyond their academic careers. In practicing the higher-order cognitive skills of synthesis and evaluation, they are enhancing their civic and scientific literacy so that when they graduate, they will have the tools to make informed decisions about personal science-based issues such as how to best protect themselves from potentially harmful bacteria in public restrooms, whether to become an early or a later adopter of self-driving cars, how microbes could be the solution for pollution problems, and how data can give insights into issues of social justice abroad and at home. Similarly, the skills that students acquired as they built their ePortfolios enhance their life-long, effective digital citizenship. When they graduate, they will be experienced at using digital tools to research the validity and credibility of media content available online and to communicate effectively their understanding on issues (e.g., childhood vaccinations, data protection, global warming) related to science and technology affecting themselves and their communities.

Limitations

As described earlier, more STEM programs are beginning to use ePortfolios in conjunction with other HIPs such as undergraduate research on authentic problems to encourage intentional learning and increase persistence in their majors. However, despite institutional support, implementation across programs may vary considerably with some departments and faculty using ePortfolios consistently and others not using them or using them irregularly and in limited ways only, which is the case at Eugene Lang. At other institutions where platforms have changed and the perceived learning curve for implementation is high, the initiative has come from individual faculty championing their use within their courses and programs while spearheading efforts for more widespread adoption, which is the case at Santa Clara University. However, even in less ideal situations, our STEM and English course pilots have shown that students can still benefit from even partial ePortfolio adoption.

Future Directions

We recognize that our work is not complete and there are many directions that we could take,

particularly in the area of assessment. While there are many effective VALUE rubrics, there is no clear choice for assessing civic and scientific literacy. Interdisciplinary assignments pose unique challenges when it comes to assessment. As much as we hate to admit it, our language and styles differ across the disciplines and something that might work well for the humanities will need to be adapted for other audiences. While we consider that the gold-standard for institutions would be to integrate ePortfolios throughout the curriculum, we recognize the challenges and barriers noted above. A good first step would be to integrate an ePortfolio assignment into at least one course, potentially in the first-year experience, and to attempt to integrate into others once students are familiar with their use. We plan on doing just that. At Eugene Lang, we plan to use ePortfolios in a new course, Building Your Career Ecosystem. This will represent the third implementation of ePortfolios in the department and will serve as a model for other STEM majors at the college. At Santa Clara University, we plan to use ePortfolios in several courses of our new neuroscience major and in all writing-intensive courses for our engineering majors.

Conclusion

Our paper has revealed the many different ways that ePortfolios can be leveraged to bridge the gaps between our disciplines and work synergistically with writing intensive courses to create connections between STEM and the humanities. From individual ePortfolio-based assignments and activities to semester-long PBL and degree-spanning work, we have shown how implementing ePortfolios throughout students' academic programs can ameliorate curricular fragmentation by encouraging students to reflect on connections between concepts and content inside and outside their major to maximize the benefits of HIPs such as first-year experiences, undergraduate research, and writing-intensive courses. Also, it is equally important to communicate that learning to a variety of different audiences. In this way, ePortfolios bring coherence and cohesion to students' studies and demonstrate the plethora and diversity of student learning in the digital age. Despite our disciplinary differences, we have shown how ePortfolios in science and English classes can be leveraged to connect classroom learning with issues of real-world importance. In the 21st century, the need for interdisciplinary and integrated thinking about the world and the problems we face is clearly evident to institutions and employers. Powerful ePortfolio-based pedagogy offers a venue that can adapt and flex to serve the needs of faculty and students alike while expressing student learning in a public and accessible way and to multiple audiences.

References

Ambrose, S. A., Bridges, M. W., Dipietro, M., Lovett, M. C., & Norman, M. K. (2010). *How learning works: Seven research-based principles for smart teaching.* San Francisco, CA: Jossey-Bass.

American Association for the Advancement of Science (2011). *Vision and change in undergraduate biology education: A call to action.* Retrieved from https://visionandchange.org/

Bandura, A. (1986). *Social foundations of thought and action.* Englewood Cliffs, NJ: Prentice Hall.

Bandura, A. (1997). *Self-efficacy: The exercise of control* (1st ed.). New York, NY: Freeman.

Batson, T., Coleman, K. S., Chen, H. L., Watson, C. E., Rhodes, T. L., & Harver, A. (2017). *Field guide to ePortfolio.* Washington, DC: Association of American Colleges and Universities.

Benander, R., & Rafaei, B. (2016). How authors and readers of ePortfolios make collaborative meaning. *International Journal of ePortfolio, 6*(2), 71-84. Retrieved from http://www.theijep.com/pdf/IJEP244.pdf

Blumenstyk, G. (2019). *Career-ready education: Beyond the skills gap, tools and tactics for an evolving economy.* Washington, DC: Chronicle of Higher Education. Retrieved from https://store.chronicle.com/products/career-ready-education

Bowman, J., Lowe, B. J., Sabourin, K., & Salomon Sweet, C. (2016). The use of ePortfolios to support metacognitive practice in a first-year writing program. *International Journal of ePortfolio, 6*(1), 1-22. Retrieved from http://www.theijep.com/pdf/IJEP221.pdf

Cambridge, D. (2008). Universities as responsive learning organizations through competency-based assessment with electronic portfolios. *Journal of General Education, 57*(1), 51-64. doi:10.1353/jge.0.0007

Chen, H. L., & Patel, S. J. (2017). Portfolio to professional: Supporting graduate student reflection via digital, evidence-based storytelling. *AAEEBL ePortfolio Review, 1*(2), 7-14.

Chen, H. L., & Black, T. C. (2010). Using e-portfolios to support an undergraduate learning career: An experiment with academic advising. *EDUCAUSE Quarterly, 33*(4). Retrieved from http://www.educause.edu/EDUCAUSE+Quarterly/EDUCAUSEQuarterlyMagazineVolum/UsingEPortfoliostoSupportanUnd/219102

Conefrey, T. (2018a). Building bridges with ePortfolios for first-generation college students. *AAEEBL*

ePortfolio Review, 2(3), 9-19.

Conefrey, T. (2018b). Supporting first-generation students' adjustment to college with high-impact practices. *Journal of College Student Retention*. doi:10.1177/1521025118807402

Conefrey, T., & Smyth, D. (2020). *ePortfolios to integrate learning across the curriculum and beyond: Promoting digital citizenship and civic scientific literacy*. Presented at the 11th Annual Forum on Digital Learning and ePortfolios, Washington, DC.

Cordie, L., Sailors, J., Barlow, B., & Kush, J. S. (2019). Constructing a professional identity: Connecting college and career through ePortfolios. *International Journal of ePortfolio, 9*(1), 17-21. Retrieved from http://theijep.com/pdf/IJEP319.pdf

Dewey, J. (1933). *How we think: A restatement of the relation of reflective thinking to the educative process*. Buffalo, NY: Prometheus Books.

Doren, M., & Millington, A. (2019). A pedagogy for reflective practice: Art and design thinking made visible using an online learning portfolio. *International Journal of ePortfolio, 9*(2), *75-86*. Retrieved from https://www.theijep.com/pdf/IJEP322.pdf

Dorman, S., & Brown, K. (2018). The liberal arts: Preparing the workforce of the future. *Liberal Education, 104*(4), 58-63. Retrieved from https://www.aacu.org/liberaleducation/2018/fall/dorman_brown

Douglas, M. E., Peecksen, S., Rogers, J., & Simmons, M. (2019). College students' motivation and confidence for ePortfolio use. *International Journal of ePortfolio, 9*(1), 1-16. Retrieved from http://theijep.com/pdf/IJEP316.pdf

Dweck, C. S. (2007). *Mindset: The new psychology of success*. New York, NY: Ballantine Books.

Ertmer, P. A., & Newby, T. J. (1996). The expert learner: Strategic, self-regulated, and reflective. *Instructional Science, 24*(1), 1-24. doi:10.1007/BF00156001

Eynon, B., & Gambino, L. M. (2017). *High impact ePortfolio practice: A catalyst for student, faculty, and institutional learning*. Sterling, VA: Stylus.

Eynon, B., Gambino, L. M., & Török, J. (2014). Completion, quality, and change: The difference e-portfolios make. *Peer Review, 16*(1), 1-11. Retrieved from https://www.aacu.org/publications-research/periodicals/completion-quality-and-change-difference-e-portfolios-make

Finley, A., & McNair, T. (2013). *Assessing underserved students' engagement in high-impact practices*. Washington, DC: Association of American Colleges and Universities. Retrieved from https://leapconnections.aacu.org/system/files/assessinghipsmcnairfinley_0.pdf

Fuller, K. (2017). Beyond reflection: Using ePortfolios for formative assessment to improve student engagement in non-majors introductory science. *American Biology Teacher, 79*(6), 442-449. doi:10.1525/abt.2017.79.6.442

Gallagher, C. W., & Poklop, L. L. (2014). ePortfolios and audience: Teaching a critical twenty-first century skill. *International Journal of ePortfolio, 4*(1), 7-20. Retrieved from http://www.theijep.com/pdf/ijep126.pdf

Haave, N. (2016). E-portfolios rescue biology students from a poorer final exam result: Promoting student metacognition. *Bioscene, 42*(1), 8-15.

Harring, K., & Luo, T. (2016). ePortfolios: Supporting reflection and deep learning in high-impact practices. *Peer Review, 18*(3), 9-12. Retrieved from https://www.aacu.org/peerreview/2016/summer/Harring

Hood, C. L., Holtzman, D. M., & Abbott, J. I. (2019). Essential learning outcomes (ELOs): Forming a bridge between college and the workplace. *Journal of Higher Education Theory and Practice, 19*(1), 73-79. doi:10.33423/jhetp.v19i1.670

Horak, R., Merkel S., & Chang A. (2015). The ASM curriculum guidelines for undergraduate microbiology: A case study of the advocacy role of societies in reform efforts. *Journal of Microbiology and Biology Education, 16*(1), 100-104. doi:10.1128/jmbe.v16i1.915

Howitt, S., & Wilson, A. (2016). Scaffolded reflection as a tool for surfacing complex learning in undergraduate research projects. *Council on Undergraduate Research Quarterly, 36*(4), 33. doi:10.18833/curq/36/4/8

Huber, M. T., & Hutchings, P. (2004). *Integrative learning: Mapping the terrain. the academy in transition*. Washington, DC: Association of American Colleges and Universities.

Hubert, D., Pickavance, J., & Hyberger, A. (2015). Reflective e-portfolios: One HIP to rule them all? *Peer Review, 17*(4), 15-18. Retrieved from https://www.aacu.org/peerreview/2015/fall/hubert

Hunter, A., Laursen, S. L., & Seymour, E. (2007). Becoming a scientist: The role of undergraduate research in students' cognitive, personal, and professional development. *Science Education, 91*(1), 36-74. doi:10.1002/sce.20173

Jenson, J. D., & Treuer, P. (2014). Defining the e-portfolio: What it is and why it matters. *Change, 46*(2), 50-57. doi:10.1080/00091383.2014.897192

Johnston, J., Kant, S., Gysbers, V., Hancock, D., & Denyer, G. (2014). Using an ePortfolio system as an electronic laboratory notebook in undergraduate biochemistry and molecular biology practical classes. *Biochemistry and Molecular Biology Education, 42*(1), 50-57. doi:10.1002/bmb.20754

Jones, B., & Leverenz, C. (2017). Building personal brands with digital storytelling ePortfolios. *International Journal of ePortfolio, 7*(1), 67-91. Retrieved from https://www.theijep.com/pdf/IJEP237.pdf

Kolb, D. (1984). *Experiential learning: Experience as a source of learning and development*. Englewood Cliffs, N.J: Prentice Hall.

Kuh, G. D. (2008). *High-impact educational practices: What they are, who has access to them, and why they matter*. Washington, DC: Association of American Colleges and Universities. Retrieved from http://ueeval.ucr.edu/teaching_practices_inventory/Kuh_2008.pdf

Kuh, G. D., & O'Donnell, K. (2013). *Ensuring quality and taking high-impact practices to scale*. Washington, DC: Association of American Colleges and Universities.

Landis, C. M., Scott, S. B., & Kahn, S. (2015). Examining the role of reflection in ePortfolios: A case study. *International Journal of ePortfolio, 5*(2), 107-121. Retrieved from http://www.theijep.com/pdf/IJEP168.pdf

Light, T. P., Chen, H. L., & Ittelson, J. C. (2012). *Documenting learning with ePortfolios*. San Francisco, CA: Jossey-Bass.

McGraw-Hill. (2019). *2018 McGraw-Hill future workforce survey*. Retrieved from https://www.mheducation.com/future-workforce.html

McNair, L. D., & Garrison, W. (2012, June). Portfolios to professoriate: Helping students integrate professional identities through ePortfolios. Paper presented at the 2012 ASEE Annual Conference and Exposition, San Antonio, TX.

Mills, J. L., DiCola, A., Roberts, R., Pikaart, M., Daubner, C., Irby, S., . . . Craig, P. A. (2017). Assessing learning gains through ePortfolios in an undergraduate biochemistry lab. *FASEB Journal, 31*(1), 588.13. doi:10.1096/fasebj.31.1_supplement.588.13

Morreale, C., Van Zile-Tamsen, C., Emerson, C. A., & Herzog, M. (2017). Thinking skills by design: Using a capstone ePortfolio to promote reflection, critical thinking, and curriculum integration. *International Journal of ePortfolio, 7*(1), 13-28. Retrieved from http://www.theijep.com/pdf/IJEP245.pdf

Mossberger, K., Tolbert, C. J., & McNeal, R. S. (2008). *Digital citizenship*. Cambridge, MA: MIT Press. Retrieved from http://www.loc.gov/catdir/toc/ecip079/2007002797.html

National Association of Colleges and Employers (NACE). (2019b). *Measuring competency proficiency: The career readiness pilot project*. Retrieved from https://www.naceweb.org/career-readiness/trends-and-predictions/measuring-competency-proficiency-the-career-readiness-pilot-project/

National Leadership Council for Liberal Education and America's Promise. (2007). *College learning for the new global century*. Washington, DC: Association of American Colleges and Universities. Retrieved from https://secure.aacu.org/AACU/PDF/GlobalCentury_ExecSum_3.pdf

Pasquerella, L. (2019). *Yes, employers do value liberal arts degrees*. Retrieved from https://hbr.org/2019/09/yes-employers-do-value-liberal-arts-degrees

Peck, A. (2018, September 30). Career-ready education needs colleges and businesses working together. *Chronicle of Higher Education, 65*(5), A44. Retrieved from https://www.chronicle.com/article/career-ready-education-needs-colleges-and-businesses-working-together/

Peet, M., Lonn, S., Gurin, P., Boyer, K. P., Matney, M., Marra, T., . . . Daley, A. (2011). Fostering integrative knowledge through ePortfolios. *International Journal of ePortfolio, 1*(1), 11-31. Retrieved from http://www.theijep.com/pdf/IJEP39.pdf

Picardo, K., & Sabourin, K. (2018). Measuring student learning gains in independent research experiences in the sciences through reflective practice and ePortfolios. *Bioscene, 44*(2), 29-36.

Pintrich, P. R. (2002). The role of metacognitive knowledge in learning, teaching, and assessing. *Theory into Practice, 41*(4), 219-225. doi:10.1207/s15430421tip4104_3

Ramirez, K. (2011). ePerformance: Crafting, rehearsing, and presenting the ePortfolio persona. *International Journal of ePortfolio, 1*(1), 1-9. Retrieved from http://www.theijep.com/pdf/IJEP21.pdf

Reynolds, C., Patton, J., & Rhodes, T. (2014). *Leveraging the ePortfolio for integrative learning: A faculty guide to classroom practices for transforming student learning*. Sterling, VA: Stylus.

Rhodes, T. (2014). Assessing outcomes and improving achievement: Tips and tools for using rubrics. *Peer Review, 16*(3), 32. Retrieved from https://www.aacu.org/value-rubrics

Rodgers, C. (2002). Defining reflection: Another look at John Dewey and reflective thinking. *Teachers College Record, 104*(4), 842-866. doi:10.1111/1467-9620.00181

Santa Clara University. *Core curriculum*. Retrieved from https://www.scu.edu/provost/core/

Schön, D. A. (1983). *The reflective practitioner: How*

professionals think in action. New York, NY: Basic Books.

Schrand, T., Jones, K., & Hanson, V. (2018). "Reflecting on reflections:" Curating ePortfolios for integrative learning and identity development in a general education senior capstone. *International Journal of ePortfolio, 8*(1), 1-12. Retrieved from http://www.theijep.com/pdf/IJEP296.pdf

Schraw, G., Crippen, K., & Hartley, K. (2006). Promoting self-regulation in science education: Metacognition as part of a broader perspective on learning. *Research in Science Education, 36*(1), 111-139. doi:10.1007/s11165-005-3917-8

Shen, B. S. P. (1975). Scientific literacy and the public understanding of science. In S. B. Day (Ed.), *Communication of scientific information* (pp. 44-52). Basel, Switzerland: Karger. Retrieved from https://doi.org/10.1159/000398072

Sieg, R. D., Beverly, N., Narayanan, M., Surendran, G., Sabatini, J., & Smyth, D. (2019). Incubating the SENCER ideals with project-based learning and undergraduate research: Perspectives from two liberal arts institutions. *SECEIJ, 11*(1), 50-64. Retrieved from http://new.seceij.net/articletype/teaching-and-learning/incubating-the-sencer-ideals-with-%e2%80%a8project-based-learning/

Singer-Freeman, K., & Bastone, L. (2017). Changing their mindsets: ePortfolios encourage application of concepts to the self. *International Journal of ePortfolio, 7*(2), 151-160. Retrieved from https://www.theijep.com/pdf/IJEP262.pdf

Singer-Freeman, K., Bastone, L., & Skrivanek, J. (2014). ePortfolios reveal an emerging community of underrepresented minority scholars. *International Journal of ePortfolio, 4*(1), 85-94. Retrieved from http://theijep.com/pdf/IJEP131.pdf

Singer-Freeman, K., Bastone, L., & Skrivanek, J. (2016). Using ePortfolios to assess applied and collaborative learning and academic identity in a summer research program for community college students. *International Journal of ePortfolio, 6*(1), 45-57. Retrieved from http://theijep.com/pdf/IJEP202.pdf

Smyth, D., & Conefrey, T. (2019). *Leveraging eportfolios for civic scientific literacy.* Presented at the SENCER Summer Institute, Case Western Reserve University, Cleveland, OH.

The New School. (2020). *Mission.* Retrieved from https://www.guidestar.org/profile/13-3297197

Tukibayeva, M., & Gonyea, R. M. (2014). High-impact practices and the first-year student. *New Directions for Institutional Research, 160*, 19-35. doi:10.1002/ir.20059

Watson, C. E., Kuh, G. D., Rhodes, T., Light, T. P., & Chen, H. L. (2016). Editorial: ePortfolios—The eleventh high impact practice. *International Journal of ePortfolio, 6*(2), 65-69. Retrieved from http://theijep.com/pdf/IJEP254.pdf

Watson, M. (2019). Using professional online portfolios to enhance student transition into the poststudent world. *Business and Professional Communication Quarterly, 82*(2), 153-168. doi:10.1177/2329490618824703

Wear, A. N., & Baltazar, M. (2019). ePortfolio as evidence for marketable skills credentials. *AAEEBL ePortfolio Review, 3*(1), 9-12. Retrieved from https://aaeeblorg.files.wordpress.com/2019/06/aepr-v3n1.pdf

World Economic Forum. (2016). *The future of jobs: Employment, skills and workforce strategy for the fourth industrial revolution.* Geneva, Switzerland: World Economic Forum. Retrieved from https://http://www3.weforum.org/docs/WEF_FOJ_Executive_Summary_Jobs.pdf

Yancey, K. (1998). *Reflection in the writing classroom.* Logan, UT: Utah State University Press. doi:10.2307/j.ctt46nsh0

Yancey, K. B. (2009). Electronic portfolios a decade into the twenty-first century: What we know, what we need to know. *Peer Review, 11*(1), 28-32. Retrieved from https://www.aacu.org/publications-research/periodicals/electronic-portfolios-decade-twenty-first-century-what-we-know

---

THERESA CONEFREY is a lecturer in the Department of English at Santa Clara University. She also serves as an adjunct professor in the Department of Engineering Management and Leadership.

DAVIDA SMYTH is an Associate Professor of Natural Sciences at Eugene Lang College of Liberal Arts at The New School. She is Deputy Director of the National Center for Science and Civic Engagement, a PULSE Fellow and a PALM Mentor.

Graduate Students' Perceptions of Factors that Contributed to ePortfolios Persistence Beyond the Program of Study

Tilisa Thibodeaux, Dwayne Harapnuik, Cynthia Cummings, and Jackson Dolce
Lamar University

This study examined the factors that contributed to ePortfolio persistence in an online program from data collected in 2016 (Thibodeaux, Harapnuik, & Cummings, 2017) and again in 2018. A myriad of research points to learning portfolios as having transformational power; however, many traditional instructional models that use ePortfolios in higher education downplay the significance and transformational learning that effective ePortfolios offer. To research this phenomenon, a convergent, parallel mixed-methods design was used to gather data from an online program in order to explore the learning conditions and context of ePortfolio usage over multiple years. Results indicated that real-world projects and authentic artifacts, the ePortfolio used as a career tool, and management of the ePortfolio were common factors identified in studies that contributed to continued use of the ePortfolio. Findings also revealed that learner autonomy, control, and agency, as well as continued opportunities for choice and voice, led to increased appreciation and ownership of the ePortfolio beyond the program of study.

In the past several years, ePortfolios became the 11th high impact practice influencing the educational landscape in higher education because of their power to transform learning (Association for American Colleges and Universities, 2016; Kuh, 2016; Mueller & Bair, 2018). ePortfolios can enhance marketability skills, career development, and professional identity of graduates and therefore, it is not surprising that ePortfolios are increasingly being used in higher education institutions around the globe (Watty & McKay, 2016). Yet, very few instructors use the ePortfolio as an interactive and integrative tool within the learning environment (Mueller & Bair, 2018). Many students still believe that learning is simply information reproduction, regurgitation of ideas, and acquisition of knowledge and content, and less about transformation (Amory, 2014). The former President of the Association of Authentic, Experiential, and Evidence-Based Learning (AAEEBL) organization argued that it was imperative that stakeholders and providers understand the value and "transformational power of ePortfolios" or ePortfolios will become likened to assessment and learning management systems (Batson, 2016, para. 14). *Transformational learning* involves active engagement with the learning process, contribution to the social aspect of learning, and understanding of content that enables learners to build newfound concepts that will validate and move their own thinking forward (Mezirow, 1997). Therefore, it is incumbent upon schools of education to consider models of teaching and learning that have a broader impact on students' intellectual domains.

Research reveals that traditional teaching and learning models use "content driven, factual . . . [and] externally devised curriculum specifications" (Poole et al., 2018, p. 12) which do not provide significant learning environments that incorporate constructivist principles and collaborative learning opportunities essential to the learning experience (Thibodeaux, Harapnuik, & Cummings, 2019a). According to Poole et al. (2018), if ePortfolios are to be "owned" by the learner, a review of current standardized, template-based ePortfolios in conjunction with real and genuine authentic learning assignments are necessary to effectively align course and program learning outcomes. For this reason and many others, our research team decided that replicating the 2016 study by Thibodeaux, Harapnuik, and Cummings (2017) would allow us to investigate the factors that contributed to both continued and discontinued use of ePortfolios beyond the program of study. In the current study, ePortfolios were an integral part of the learning process within a significant learning environment that gave learners choice, ownership, and voice through authentic learning opportunities (COVA).

Literature Review

In this literature review, we examine the use of ePortfolios as a learning portfolio and provide a description of the theoretical framework grounded in constructivism and collaborative learning environments used in conjunction with the COVA learning approach (i.e., choice, ownership, and voice through authentic learning opportunities). We also examined research to identify factors that contributed to deeper and continued use of ePortfolios beyond the students' program of study to understand the optimal conditions in which students thrive using ePortfolios.

Learning Portfolios

Harapnuik (2015) defined ePortfolios as a "learner's digital evidence of meaningful connections"

(para.1). ePortfolios offer learners opportunities to produce signature work that includes sense and meaning-making of their own ideas through authentic learning experiences when posting and sharing those experiences (Matthews-DeNatale, Blevins-Bohanan, Rothwell, & Wehlburg, 2017; Thibodeaux, Harapnuik, & Cummings, 2019b; Watson, Kuh, Rhodes, Light, & Chen, 2016). Further, ePortfolios provide opportunities for engaged learning and social collaboration to meet academic and career goals through analysis, synthesis, and evaluation of one's own learning experience (Mueller & Bair, 2018). Additionally, aligning reflection and discourse to learning outcomes and objectives are key to learner growth when integrating portfolios academically (Mezirow, 1997).

ePortfolios should not be disconnected from the curriculum (Yancey, 2016) acting as a "bolted on" task to the existing learning environment (Papert, 1993). Otherwise, according to Papert (1993), ePortfolios will take on the effect of strapping a jet engine onto a horse cart where the jet engine will just shake apart the cart and the horse will get angry because it is unable to move forward. For this reason, it is incumbent upon learning facilitators to use and align ePortfolios to learning outcomes that lead to authentic application of ideas in genuine settings (Yancey, 2016; Thibodeaux et al., 2019b). If ePortfolios are bolted onto the learning environment, they can easily become a tool relegated to assessment of knowledge and information retrieval, which inhibits the full potential of using ePortfolios as learning tools (Roberts, Maor, & Herrington, 2016). Buyarski, Oaks, Reynolds, & Rhodes (2017) pointed out that ePortfolios in higher education are often categorized or limited to particular silos such as communication, problem-solving, writing, and inquiry portfolios. While these individual skills are necessary, Buyarski et al. (2017) argued that ePortfolios in silos lack the integration of lifelong learning skills and are further limited by the traditional prescriptive "check-the-box" learning approach.

Based on our own research and experience, the following sections describe more in-depth the COVA learning approach that was first mentioned in the introduction. The COVA learning approach gives ownership and control back to the learner through authentic learning opportunities that are purposefully designed to promote self-directed and lifelong learning.

Theoretical Framework

The COVA learning approach is a collaborative, learner-centered approach that is grounded in the learning philosophies of Dewey, Bruner, Piaget, Papert, and Bandura. The approach uses active and authentic learning opportunities through the creation of significant learning environments to give learners control and ownership of their learning. The approach also emphasizes that learning occurs most deeply through engagement in collaborative thinking and problem solving that utilizes feedback and feedforward from instructors and peers. The latest iteration of the COVA learning approach was formalized by Harapnuik, Thibodeaux, and Cummings in 2015 and is based on a summary of the key Inquisitivism fundamentals established through the research of Harapnuik in the late 1990s and early 2000s (Harapnuik, 2004, 2008, in press). Creating (C) significant (S) learning (L) environments (E) where the learner is given choice (C), ownership (O), and voice (V) through authentic (A) learning opportunities is also referred to as the CSLE+COVA framework (Harapnuik, 2017). The use of authentic learning opportunities such as the ePortfolio becomes the catalyst for giving learners choice, ownership, and voice. While the COVA learning approach supports student-centered learning environments, to be truly effective, these types of environments must purposefully employ backward design principles that incorporate the proper alignment of learning outcomes, activities, and assessments. As such, immersing learners in the CSLE+COVA learning framework has widespread implications for deeper learning through constructivist principles, collaborative learning, deepening ownership, and true, authentic learning opportunities. While this brief description shares a snapshot of the foundation for this approach, the subsequent sections will outline how the COVA learning approach is used as the framework for our program and plays a role in our research focus and inquiry for this study.

Constructivism

Based on core ideas established by Carl Rogers in the late 1960s, Bates (2019) described constructivism as one's ability to exercise conscious thought, free will, and social learning where learning is personal, new ideas are tested, and knowledge is constructed from new experiences that build upon previous experiences. Prior to Rogers, Dewey (1910) described learning as the ability to link prior knowledge to relevant knowledge through collaborative learning experiences. Likewise, Piaget revered the learner as the "constructor" of knowledge wherein learning is derived from the making of meaning or knowing and assimilations are created through intellectual and problem-solving experiences (Dewey, 1910; Piaget, 1950). However, it was Piaget (1950) who made the argument that learning does not only occur in one's own mind through cognitive schemes. Building on this thinking decades later, Schrader (2015) claimed that integrative experiences and active engagement help the

learner mold and shape their thinking to include social interactions that offer additional opportunities for learning. According to McWilliams (2016), constructivists postulate that humans have pre-conceived ideas, notions, and belief systems that are molded and shaped through choices and social connections and claim that the reality of phenomena in our environment is our perceived truth. Further, similar to Rogers, Jonassen (2006) argued that meaningful learning relies on the construction of ideas and experiences that rely on sociocultural influence to generate new ideas, epistemology, and phenomenology. Embracing the aforementioned historical perspectives, the COVA learning approach is deeply rooted in constructivism and relies on (a) the process of learning and meaning making, (b) the conditions and context in which optimal learning environments can thrive, (c) active engagement in the learning process from principles to problem-solving, and (d) developing new avenues of thinking for future pathways (McWilliams, 2016; Thibodeaux et al., 2017).

Collaborative Learning Opportunities

According to Mezirow (1997), learners must become "autonomous agents in a collaborative context" (p. 8). Likewise, Bandura (2000) proposed that learning is dependent on social systems where collective learning provides opportunities to build self-efficacy. Historically, teaching models ignore this collaborative and transformative focus and tend to be based on content, knowledge, and skills and less about progress, growth, and changes in disposition. This misalignment subsequently leads to the use of an ePortfolio as an externally driven and prescriptive tool (Poole et al., 2018). In contrast, Pitts and Lehner-Quam (2019) suggested that across pedagogical practices and disciplines, ePortfolio implementation should be embedded in socially integrative learning environments that provide opportunities for engagement and collaboration. Based on an ePortfolio social pedagogy ecosystem, Pitts and Lenher-Quam (2019) determined that construction and communication of understanding how to share one's learning with an authentic audience is integral to integrative learning experiences. Furthermore, for students to delve deeper into their learning, ePortfolios should be connected to reflective practice (Pitts & Lehner-Quam, 2019) and social constructivist principles (McWilliams, 2016).

Choice

Dewey (1916) advocated that learners must be given choice if they want to develop meaning and purpose in their learning. According to Buchem, Tur, and Hölterhof (2014), as learners are given more choice during the learning process, their own purpose, and the content they produce, control is shifted from the organization to the learner and intrinsic motivation is elevated. Shifting control to the learner means allowing for choice of content and sequence of steps and learning tools to support the learning process (Buchem et al., 2014). To understand the value of ePortfolios, learners must be able to make decisions about what should be included to achieve learning outcomes (Roberts et al., 2016). Further, overly prescriptive ePortfolios built from templates and rigid guidelines limit the value of ePortfolios to a checklist of items to complete (Munday, 2017). While instructional design (ID) frameworks provide choices such as control of the sequence of topics, level and degree of difficulty, pacing of content, display and viewing of materials, and learning materials support; ID frameworks strengthen learner dependence on the system and offer very little control and ownership of the learning environment itself (Buchem et al., 2014). Creative expression and value are critical to engagement with the ePortfolio; otherwise, learners will not invest in themselves and the ePortfolio becomes another summative assessment in their program of study (Matthews-DeNatale et al., 2017).

Ownership

According to Andrus et al. (2017), taking ownership of one's ePortfolio is linked to reflection, autonomy, and self-efficacy. As such, ePortfolios can give learners ownership of their ideas through active learning and engagement (Watson et al., 2016). Buchem et al. (2014) argued that learning approaches that call for a learner-centered environment are effective because these (emancipatory) approaches emphasize autonomy and control of the learning process. Students who choose to engage with the ePortfolio in these types of learner-centered environments and are reflective and innovative will far exceed learning outcomes (Mueller & Bair, 2018). Taking ownership of the ePortfolio can harness and "enable deeper explanations of 'self' and development over time" (Munday, 2017, p. 178); therefore, it is vital that learners understand the purpose and invest in their ePortfolio so they will value their own learning and development (Roberts et al., 2016). According to Matthews-DeNatale et al. (2017), students who reflect and participate in integrative learning experiences will take ownership of their learning and think more deeply as a result.

Voice

Discovering one's voice is critical to transformational learning (Mezirow, 1997). Mezirow (1997) defined autonomy as the process of becoming critically reflective and that one's own understanding

builds values and confirms one's own thinking, which ultimately leads to transformational learning. Further, Mezirow argued that autonomy is required for learning to be productive. In ePortfolio learning environments, reflection constitutes the learner making connections through authentic learning experiences (Landis, Scott, & Kahn, 2015), the examination of personal belief systems, and development of self-efficacy (Bandura, 1977). Giving learners a voice through reflection and social reciprocity helps students connect their learning experiences to self and to others (Eynon, Gambino, & Török, 2014). Therefore, if thinking and reflecting are not connected to the larger picture of what students are trying to achieve, they may never assess their own learning on a metacognitive level, which impacts their ability to become self-regulated learners (Steiner, 2016).

Authenticity

Steiner (2016) described authentic activities as those that require collaborative problem-solving skills that are relevant, partially unstructured, and involve real-world opportunities for the application of ideas in real-world settings. Ideally, authentic learning allows learners opportunities to make decisions as they reflect and collaborate on those ideas (Roberts et al., 2016). Authentic learning experiences described this way resonate with Dewey's (1916) thinking that experiential learning involves inquiry and the making of meaning through a cyclical process of experience, reflection, conceptualization, and experimentation, which is then repeated. Combining Dewey's philosophy of learning and the theory of constructivism, learning is constructed from experiences that are organic to the environment in which concepts and prior knowledge are applied from one experience to the next. Amory (2014) noted that while authentic learning presents challenges in the beginning, students described that they learned more than they expected to learn when provided these opportunities.

The Digital Learning and Leading Online Program

The Digital Learning and Leading (DLL) program is an online, 36-hour degree program at a regionally accredited institution in the southern United States. Currently, the program offers 12 courses, one of which is specifically designated for ePortfolio design and development using the COVA learning approach. The ePortfolio course was designed to allow learners to select the tools and platform desired in the program and to organize, structure, and present their chosen learning experiences through their ePortfolios. The ePortfolio course allows learners opportunities to revise and restructure their previous learning experiences, find their voice, build out their social media connections, post blogs, and share authentic projects from their own

work. In all other courses in the program, learners use the ePortfolio to share their progress on authentic projects they produce. Learners personally organize and reflect on their learning while collaborating and providing feedback to one another.

Students in the DLL program develop innovation plans that become the foundational authentic learning opportunity that allows them to experience real and genuine learning through implementation. Elective courses offer students opportunities to investigate and research ideas around their innovation plans to further advance their knowledge and expertise and add to those plans. As stated in the literature review, the main pedagogical connective thread throughout the program is the COVA learning approach as the context for each learning experience. More specifically, students use the ePortfolio to share and promote their own ideas and innovation plans to their audience in their own organizations. At the end of the program, students are required to submit an ePortfolio capstone that shares personal reflections about their learning journey as they authentically applied and implemented their innovation plans in their own organizational settings and school districts. Additionally, the ePortfolio capstone captures their overall experience in the program and plays a role in whether or not they continue to use their ePortfolio.

To set the context, this study sought to reveal the factors that contributed to the discontinued use, and continued use, of ePortfolios by graduate students beyond their program of study. By collecting and analyzing empirical evidence, we sought to better understand how the COVA learning approach impacted key items identified as important factors that helped our students learn and grow using ePortfolios in both studies. Our goal is to enhance the learning environment for our students as we enter into the next phase of restructuring and redesigning our program, but also to inform others who are looking to establish ePortfolios as part of their program.

Our Research Focus and Study Questions

To evaluate our current approach, our research aimed to provide empirical evidence to determine the broader impact of ePortfolio usage as part of a program of study; however, first we must make the conditions clear. In the 2016 study, the previous program requirements for the ePortfolio included rigorous reflective practice, transference of ePortfolio learning for PK-12 learners, and differentiated assessment. In the previous study, much of the contents of the ePortfolio was dictated by program and accreditation requirements where posting to the ePortfolio was marked by a row on the rubric. While there was some degree of agency involved, students did not have opportunities that allowed them to

experience choice, ownership, and voice through the ePortfolio as they did in the 2018 study.

In the DLL program as part of the 2018 study, the ePortfolio was used as an authentic learning opportunity where students posted and shared all of their work, reflections, collaborations, and feedback. Student innovation plans, blog posts, literature reviews, and implementation plans were woven into the ePortfolio through a navigational structure of their choosing. Rubrics are open-ended to allow for creative thinking and implementation of student innovation plans and ideas.

Looking ahead to the next phase of our program and to prepare for this transition, it was necessary for our research team to explore the factors that contributed to continued use or discontinued use of the ePortfolio to ensure that the revised program supports a sustainable and scalable ePortfolio initiative that extends beyond the program of study. Therefore, we developed items for this study that were specifically integrated into our MEd program that were assumed to make the largest impact on learning and ePortfolio usage. Our research team sought to answer the research question: Which factors contributed to the persistent use of, or discontinued use of, ePortfolios beyond the program of study? To answer this question, the following section provides an overview of the methodology selected to acquire data and the collection and analysis used to conduct the study.

Methodology

Research Design

This study replicated the convergent parallel, mixed-methods design used in the initial study conducted in 2016. The purpose for replicating the study was to examine responses to the existing items to determine the perceived impact under different learning conditions. For example, the previous study used the ePortfolio as a repository for assignment posting, reflection, and as an assessment tool. In contrast, the current study uses the ePortfolio as a learning portfolio within the context of a significant learning environment that gives learners choice, ownership, and voice through authentic learning opportunities (Thibodeaux et al., 2017). Both quantitative and qualitative data were obtained to compare the data sets to the previous study to determine convergent and divergent responses. By collecting both sets of data, we were able to compare and contrast the optimal conditions in which learning thrives when using ePortfolios as part of the learning environment.

Participants

In 2018, all 71 existing graduates of the DLL Med program were invited to participate in the study. All graduates were employed in PK-12 educational institutions. Both males and females participated in the study at their discretion. We decided that convenience sampling would be the best method to collect data that would most closely represent all graduate students who participated in the program at any given time. A total of 50 graduates consented to participate, eliciting a 70% response rate for the online survey portion of the study. Seven graduates also agreed to partake in semi-structured interviews. As former students, the MEd graduates constructed an ePortfolio in their first course of the DLL program where they were encouraged to select a platform to initially share their work. In the second course of the DLL program, students focused on exploring alternative ePortfolio platforms and experimented with ways that they could use their ePortfolios throughout the duration of the program. Students were given the opportunity and were encouraged to organize, present, and structure their ideas to build their ePortfolios to support their unique learning needs both during and beyond their program of study. Students going through this process were encouraged to post regularly and to develop their voice through the process of revising and restructuring their platforms, authentic projects, and learning experiences shared on their ePortfolio.

In the 2016 study, 141 out of 533 (26%) graduates participated in the study. The context for building the ePortfolio from the 2016 program requirements was quite different than the current study, as we shared in previous sections. While students in the 2016 study were able to select their platform, the assignments followed a more prescriptive format with a rubric checklist of items to be shared. As a result, students viewed the ePortfolio as an assessment portfolio rather than a learning portfolio. For this reason, it was important for our research team to pinpoint the differences as to why students persisted in using their ePortfolios beyond their program of study.

Data Collection and Analysis

To collect descriptive data, an online survey was emailed three times over a 6-week period using a professional research platform tool provided by the university. Descriptive statistics were analyzed using SPSS to determine the average score for the items, which utilized the following ranking scale: 1 (*strongly disagree*), 2 (*disagree*), 3 (*neutral*), 4 (*agree*), 5 (*strongly agree*), and NA (*not applicable*). After the last question on the survey, one additional question asked participants if they would be willing to participate in follow-up interviews. For those who agreed, interviews were conducted in small groups (three to four graduates per interview) online using a video software tool. Interview transcriptions were analyzed for emerging themes using

Table 1
Response Percent and Count for Graduate Students Who Used ePortfolios

	2016 responses		2018 responses	
Answer option	%	*N*	%	*N*
Yes	17.7	025	70	35
No	82.3	116	30	15

Note. Reprinted in part from "Factors That Contribute to ePortfolio Persistence," by T. N. Thibodeaux, D. K. Harapnuk, and C. D. Cummings, 2017, *International Journal of ePortfolio, 7*(1), p. 7. Copyright 2017 by the International Journal of ePortfolio. Reprinted with permission.

Table 2
Comparison of Graduate Students' Reported Averages for Discontinued Use of ePortfolio

	Averages	
Items	2016 study discontinued use *n* = 116	2018 study discontinued use *n* = 12
Choice of ePortfolio tool/platform	00(**3.28** (4)	2.50
Control over the ePortfolio tool	3.21	2.17
Choice over evidence of learning (artifacts)	2.99	2.55
Control over the ePortfolio development process	3.06	2.25
Opportunity to be creative with ePortfolio presentation and development	3.30	2.50
Real-world projects and authentic artifacts	3.14	2.75
Management of ePortfolio	00000)**3.47** (2) (3)	3.00
Proprietary software availability after the program	00)**3.24** (5)	2.33
Assessment of own learning	2.90	2.50
Deepened my interest in learning more	2.60	2.83
Access to good examples of ePortfolios	2.96	3.00
My instructor's ePortfolio example	2.74	2.50
Receiving feedback and comments	2.96	00)**3.33** (3)
Community or social connections in ePortfolio use	2.98	00)**3.33** (3)
Personal interest level in ePortfolio use	00000)**3.47** (2) (3)	00)**3.33** (3)
Discussion about lifelong use of the ePortfolio	2.95	2.67
School's or institution's attitude toward ePortfolio use	2.99	00)**3.33** (3)
Used as a career tool	2.77	3.17
Planning	3.17	00)**3.75** (2)
Time	00)**3.50** (1)	00)**3.83** (1)

Note. **Bolded** numbers are in the top five rating averages for the item. The number in parenthesis indicates the place of the item in the top five from highest rating average to lowest rating average within the top five items. Likert scale items ranged from 1 (*strongly disagree*) to 5 (*strongly agree*) with *not applicable* responses excluded.
Reprinted in part from "Factors That Contribute to ePortfolio Persistence," by T. N. Thibodeaux, D. K. Harapnuik, and C. D. Cummings, 2017, *International Journal of ePortfolio, 7*(1), p. 7. Copyright 2017 by the International Journal of ePortfolio. Reprinted with permission.

open coding as part of the grounded theory approach (Glaser & Strauss, 1967; Strauss & Corbin, 1990). Further, researchers used content analysis as the coding method to explore naturally occurring themes from the interviews. More in-depth content analysis was conducted by the primary researcher to ensure emerging themes were consistent with transcriptions for both content analyses. The research team used member checking, triangulation, and peer debriefing to ensure the quality and accurate interpretation of the interview data (Creswell & Guetterman, 2019).

Findings and Discussion

In the 2016 study, 141 graduates completed the exact same survey as the 50 graduates in the current study. Table 1 shows an increase from 17.7% (2016) to 70% (2018) of former students who indicated they are still using their ePortfolios beyond their program of study. For those who indicated they were not using their ePortfolios, the number decreased substantially to 30% of former students who have discontinued the use of their ePortfolios. Proportionally, the numbers

completely reversed. For this reason and others, the research team felt it was essential to follow up with respondents who indicated they would be willing to participate in interviews to gain a clearer perspective about why this occurred. (The interview findings are reported toward the end of this section.) Table 2 provides the survey rank of items related to the factors that contributed to graduates' discontinued use of ePortfolios beyond their program of study. We displayed a side-by-side comparison between the 2016 and 2018 studies to determine which factors were most influential in moving the needle towards more persistent use of the ePortfolio beyond the program of study. Similarly, Table 3 provides more in-depth Tables 2 and 3, the top five averages were bolded and rank-ordered, so it is clear which items had the most influential impact on graduate students' responses.

The subsequent sections describe in more detail the factors ranked in the top five for ePortfolio usage after graduation, highlighting the differences between the 2016 and the 2018 study rankings for graduate students' discontinued or continued use of the ePortfolio. We also offer our interpretation and explanation about how these results may have transpired.

Comparing the Factors That Related to Discontinued Use of the ePortfolio

In the 2018 study, the top-rated item related to discontinued use was time. With the demands on most educators, time to manage the ePortfolio can certainly be an obstacle, especially if students are not authentically using the ePortfolio and sharing their ideas with a specific audience. For this reason, the DLL program allocated one entire course to building out all components of the ePortfolio including a blog, categories, tags, static and dynamic pages, archives, widgets, etc. Both studies shared the common denominator that time was a factor that influenced persistent use of the ePortfolio beyond the program of study. Even with one entire course devoted to ePortfolio development, the time barrier had significant impacts on the perceptions of graduate students and their experience using the ePortfolio as part of their program of study.

In the 2016 study, the top-rated item for discontinued use of the ePortfolio was also time. In the first study, ePortfolios were used to house assignments, but we are unfamiliar with the collaboration component between students and the time it took to set up their websites. If students only used the ePortfolios as a repository, the time it took to learn how to build a navigational structure and other technical features may have had an impact on the recognized benefits (Scholz, Tse, & Lithgow, 2017).

In the 2018 study, planning which components/ideas to include on the ePortfolio was rated in the top two factors for discontinued use. A learning ePortfolio is intended for collaboration, reflection, and feedback but also for sharing with others such as administrators, parents, students, and the community. Through our experience, we have learned that sharing with others requires decision-making and ownership of ideas that students may not be comfortable with yet, especially if they do not have an authentic audience identified. For this reason, planning which components/ideas to include could be a daunting task if students do not have a clearly identified audience.

The second and third highest rated items (ranked the same) for discontinued use from the 2016 study were the management of the ePortfolio and personal interest level in ePortfolio use. This finding was not a surprise because if the ePortfolio was perceived as a repository for artifacts or seen only as an assessment portfolio, our research suggests that personal interest level tends to be lower because this is one more thing that gets bolted on to the learning environment (Papert, 1993; Thibodeaux et al., 2019a). As a result, management of the ePortfolio becomes another onerous task. In one study, Scholz et al. (2017) examined factors related to alignment or misalignment of learning outcomes and ePortfolio usage in higher education. While the context of the aforementioned study is situated across several courses and disciplines, the researchers argued that alignment is "a predictor of success in ePortfolio design" (p. 149). On the contrary, misalignment could occur based on lack of support, technology used to support the learning process, and ambiguous assignment instructions and learning outcomes—all factors that could contribute to lowered levels of personal interest.

The third highest ranked items in the 2018 study spanned across four different items, that made up only six participants who discontinued use of their ePortfolio. The four items included receiving comments and feedback, community and social connections in ePortfolio use, personal interest level in ePortfolio use, and school or institution's attitude toward ePortfolio use. Deeper examination of the data revealed that three of these items ranked very highly in comparison to graduate students' averages for continued use of ePortfolios—over 4.1 (see Table 3) with the exception of community or social connections in ePortfolio use. It is possible that some participants misinterpreted some of the scale items. One explanation is the three highest ranked items do not necessarily mean that these items contributed solely to discontinued use; but perhaps, these items were not factors that ranked very highly in terms of continued use. While this is just one explanation, we had a few additional ideas included in the following paragraph that could explain these rankings.

The fourth item that contributed to discontinued use in the 2016 study was the choice of ePortfolio tool and/or platform. While students were allowed to choose their own platform, some selected a particular platform

Table 3
Comparison of Graduate Students' Reported Averages for Continued Use of ePortfolio

	Averages	
Items	2016 study continued use $n = 25$	2018 study continued use $n = 35$
Choice of ePortfolio tool/platform	3.48	4.35
Control over the ePortfolio tool	3.56	00(**4.69** (2)
Choice over evidence of learning (artifacts)	3.72	00(**4.53** (5)
Control over the ePortfolio development process	3.68	00(**4.66** (3)
Opportunity to be creative with ePortfolio presentation and development	3.52	00(**4.53** (5)
"Real" world projects and authentic artifacts	00(**3.84** (2)	00(**4.72** (1)
Management of ePortfolio	00(**3.76** (4)	00(**4.53** (5)
Proprietary software availability after the program	3.64	4.25
Assessment of own learning	00(**3.79** (3)	4.38
Deepened my interest in learning more	3.72	4.41
Access to good examples of ePortfolios	3.72	4.16
My instructor's ePortfolio example	3.65	4.09
Receiving feedback and comments	00(**3.75** (5)	4.19
Community or social connections in ePortfolio use	3.54	3.88
Personal interest level in ePortfolio use	3.68	4.48
Discussion about lifelong use of the ePortfolio	3.60	4.19
School's or institution's attitude toward ePortfolio use	3.60	4.16
Used as a career tool	00(**3.88** (1)	00(**4.56** (4)
Planning	3.70	4.03
Time	3.65	3.84

Note. **Bolded** numbers are in the top five rating averages for the item. The number in parenthesis indicates the place of the item in the top five from highest rating average to lowest rating average within the top five items. Likert scale items ranged from 1 (*strongly disagree*) to 5 (*strongly agree*) with *not applicable* responses excluded.
Reprinted in part from "Factors That Contribute to ePortfolio Persistence," by T. N. Thibodeaux, D. K. Harapnuik, and C. D. Cummings, 2017, *International Journal of ePortfolio, 7*(1), p. 7. Copyright 2017 by the International Journal of ePortfolio. Reprinted with permission.

such as Google Sites because their schools were committed to using that particular tool. Unfortunately, some of those tools and platforms were found to be limited and not designed as robust website platforms, thus impacting control and functionality. Research shows that compulsory application of tools prescribed by a program also does little for ownership and transparency of information (Buchem et al., 2014). If the ePortfolio is used primarily as a learning tool where aspects of choice, ownership, voice, collaboration, and feedback become vital components of the learning process, real-world application of projects and authentic learning experiences shared on the ePortfolio are considered worthwhile. In the 2016 study, the fifth highest item was proprietary software availability after the program. Some students were unclear about the difference between their current ePortfolio and the portfolio accreditation assessment tool, which could have caused additional confusion. Based on graduate

student perceptions from the 2016 interviews, there was also some concern about whether districts would support the use of their selected ePortfolio platform or whether their pre-selected ePortfolio platform could even be used in their districts.

Some of the limitations of particular platforms do not allow for easy commenting and feedback and if that component was missing, students did not benefit from peer collaboration in the way that other students did that had the commenting feature available. The lack of collaboration could have adversely impacted the responses to the community and social connections and personal interest level in ePortfolio components on the survey. Since many students at the time the studies were conducted indicated that their schools were not using ePortfolios, or their districts did not support them, it was difficult for them to step back and see the bigger picture context and benefits of the ePortfolio. Also, if students did not take ownership of their ePortfolio during their time in the program, this could perpetuate a lower personal interest level in the ePortfolio.

Comparing the Factors that Related to Continued Use of the ePortfolio

In the 2018 study, the highest rated item was real-world projects and authentic artifacts—all components added to the ePortfolio during the learning experience. Within a significant learning environment, participants built an innovation plan where all of their coursework related to that innovation plan and was posted to their ePortfolio. As an example, if their innovation plan was a blended learning initiative, taking the innovation proposal to a full innovation plan would require authentic application of ideas, planning, revising, iterating, and building out media pitches. Learners who experienced a significant learning environment understood that experimentation, exploration, and creativity provided infinite opportunities for learning (Thomas & Brown, 2011) but that all of this would be shared on their ePortfolio on the world wide web for their peers and others to see. Students who took ownership of their ePortfolios saw the value of using their work to help them secure future career goals. On the contrary, assigning numerical values to ePortfolios can defer ePortfolio usage to knowledge and skill requirements that downplay the notion of transformative learning (Mueller & Bair, 2018)—this finding is significant because authentic and real projects become the focus of the ePortfolio and using the ePortfolio as a career tool becomes a by-product of taking ownership through application of their own ideas. This shift is noteworthy because the ePortfolio used as a career tool dropped to the fourth place in the 2018 study instead of first place in the 2016 study. In the 2016 study, the top-rated item for participants who continued to use the ePortfolio was using their website as a career tool. Graduate students saw the benefit of having an ePortfolio tool to showcase their learning and share their best assignments during their course of study.

Control of the ePortfolio and development process was ranked second and third highest for continued use in the 2018 study. Using the COVA learning approach, we came to realize that the more prescriptive the assignment or task, the less creative students would be. We also confirmed that control gave learners a degree of agency that fueled internal motivation. Learners who have a sense of autonomy, mastery, and purpose align their values and belief systems with their inner most desires and goals (Pink, 2009). Harvard researcher and professor Rose (2016) stated, "People are happiest when they have control over everything that's important to them" (p. 163), and we found that this statement had evidence to support its claim in both research studies. In the 2016 study, the second highest rated item was real-world projects and authentic

artifacts. It is no surprise that with the shift to a learner-centered learning environment, this item was ranked almost an average point higher in the 2018 study. In our study, we discovered that the more ownership and control the learners had, the more likely they were to persist in using their ePortfolios after their degree program concluded.

In the 2018 study, the fourth highest ranked item was use of the ePortfolio as a career tool. This is not surprising because the assignments students added to the ePortfolios were part of their own forward thinking and bigger picture plans to impact their learning environments and schools. We noted that this average was much higher than the previous rating in the 2016 study most likely because the ePortfolio was used as a career tool as a result of students taking ownership of the ePortfolio. The third and fourth highest rated item in the 2016 study was assessment of one's own learning and management of the ePortfolio. Graduates who participated in the 2016 study may have experienced the ramifications of only collecting items to add to the ePortfolio for institutional requirements or accrediting bodies, which in turn may have caused assignments to be viewed as overly prescriptive and negatively impacting reflection and story-telling on the ePortfolio (Munday, 2017).

In the 2018 study, the fifth highest ranked items that contributed to continued use included choice over evidence of learning, opportunity to be creative with ePortfolio presentation and development, and management of the ePortfolio. Using the COVA learning approach, students could choose how they wished to organize, structure, and present their learning, and used their voices to articulate their ideas through media projects and pitches representing their work. We assumed that managing the ePortfolio became less tedious because the students owned the learning and everything that was included on the ePortfolio was their own work and ideas, thus contributing to their values, goals, and beliefs. In the 2016 study, the fifth highest ranked item was receiving feedback and comments on the ePortfolio; this finding points to the importance of social collaboration in learning (Dewey, 1916). Feedback is integral to learning and is one of the most impactful tools that boosts student achievement (Hattie, 2009).

Interviews

In the 2016 study, Thibodeaux et al. (2017) discussed and shared the interview results and findings. In the 2018 study, the we used semi-structured interviews to corroborate, clarify, and provide additional insight into the survey results. Seven graduates participated in interviews that lasted approximately 45-60 minutes. Of the seven graduates, five indicated that they are still currently using their ePortfolios. Table 4 shows the themes that emerged from the questions.

Table 4
Emerging Themes from Interviews

Interview Questions	Emerging Themes
What are the top three factors that contributed to discontinued use of the ePortfolio?	Time
	Maintenance
	Keeping up with upgrades and updates
	On-the-job demands and constraints
What are the top three factors that contributed to your continued use of the ePortfolio?	Curating "my" own website/own domain
	Collaboration
	Showcasing my work
	Sharing/Reflection of who I am
What could be done to heighten or improve your interest in ePortfolio?	Reviewing other examples of ePortfolios
	Visible learning
	Keeping organized
What are the most important things that can be done to help you recognize the value of ePortfolios?	Ownership and voice in learning
	Helped visualize the future
	Job marketing tool/relevancy
What are the most important things that can be done to help you appreciate the value of authentic assessment?	Interest came from value
	Authentic work was used
	Retrievable resources/digital locker

Based on the interviews and information from former students who discontinued their use of ePortfolios, we deduced that priorities shifted and there appeared to be a natural progression from an ePortfolio to an Instagram or YouTube channel that enabled learners to share ideas publicly without maintaining their own site. However, drawbacks were noted as a result of this transition such as the inability to control every aspect of their accounts/platforms as they were able to do with their ePortfolio. Further, another participant said she struggled using her ePortfolio because her campus technology IT blocked outside use of websites and "locked everything down to keep everyone safe." The same graduate indicated there was no "airtime" for professional learning and no space for change in her district. Another participant concurred and shared that "state testing adds quite a bit of tension and resistance to developing alternative assessment models." One participant indicated that his ePortfolio, which was hosted on a friend's server, was hacked and he did not have the time nor inclination to rebuild it. This raises the issue of ensuring that the hosting platforms students select are secure and have backups and other security measures in place, though this is the responsibility of the student. If students are not carefully selecting their platforms, they could potentially run the risk of losing all of the work they have done.

For graduates who continued to use their ePortfolios, one participant mentioned there was significant value because his ePortfolio was a "reflection of who I am" and that the "ePortfolio became [his] brand" and he shares it often because "if it helps one person, it is worth it." Another participant

mentioned that he was offered his new job as an instructional coach because he shared his ePortfolio and all of the authentic work he included. This was similar to a comment from another interviewee whose ePortfolio was a factor in her being appointed to a new leadership position. Another participant mentioned that he needed his ePortfolio to be his and not associated entirely with his job; the same interviewee saw his ePortfolio as a locker for his digital resources.

The comments and themes from the interviews complement the survey findings in a multitude of ways. Though we were hopeful everyone continued to use their ePortfolios after they graduated from the DLL program, it was important to explore the challenges and barriers that currently exist in maintaining an ePortfolio. Despite the informative data from this study, there are limitations and several additional avenues to investigate in future studies.

Brief Summary and Practical Implications

For schools of education or institutions considering ePortfolios for learning, assessment, or writing, the following recommendations are by no means an exhaustive list of practical implications. While these suggestions are open enough to allow for any program using an ePortfolio, consider making the ePortfolio a "one stop shop" for all learning (assessment and writing included) as part of any discipline. The crosscutting themes between the 2016 and 2018 study as factors related to discontinued use of the ePortfolio were the personal interest level in the ePortfolio itself and the time needed to build the website. Not surprisingly, this

finding was corroborated by the interview data. Our suggestion would be to focus on setting up authentic learning environments (i.e., CSLE) that allow students real world application of their ideas through COVA, and to share that experience on their ePortfolios to increase their interest level and consider the process time well spent. In doing so, learners generally use their ePortfolios as a career tool that is inclusive of their future career goals; over time, they learn to manage their website as well. A simple shift in focus could make the ePortfolio the most powerful learning opportunity in any program.

Limitations and Implications for Future Research

One limitation lies in the population for this study. First, all participants included in the study were from one institution for both the 2016 and 2018 data sets. In the 2016 study, the participant population was larger and pulled from the Educational Technology Leadership program that eventually became part of the DLL program. In the 2018 study, the participant size was smaller and students were immersed in a significant learning environment that used the COVA learning approach—this was a significant programmatic change. Programmatic changes, though intentional, could account for the variance in responses to survey items and interview questions. While such responses were expected, to what degree these changes impacted our learners is worthy of further research. Further, self-selection of participants (i.e., convenience sampling) to collect data for both the survey and the interviews is subject to instructor, personal, and programmatic forms of bias, though the data did not indicate such. It was also necessary for us to replicate the previous study under different conditions so we could more closely pinpoint the factors that were influenced by the shift from a more teacher-centric to a more student-centric learning environment.

Another limitation includes the length of time between studies. Just under three years was the difference between the initial study and the replicated study. It is possible that additional time between studies could establish consistent or incongruous responses across items that would be revealed using crosstabulation methods for items and variable comparisons. Variability between instructors, methods, courses, and participant demographics indefinitely weighed into the findings of this study.

Further limitations lie in the survey developed for the study. Interpretation and degree of alignment between one's own perception of what the item deals with may have been slightly different than what we originally intended even after member checking and triangulation methods were used (Creswell & Guetterman, 2019). Overall, we noted that many items

in the 2018 study were similarly ranked in numbers indicating that graduate students had varying perceptions about the reasons they discontinued use of their ePortfolio. What led to those discrepancies? More detailed or clarified survey items or sub-survey items should be included in future study replications.

Future research could replicate the study several years from the current study to see if the results vary. Replicating this study a third time would constitute a longitudinal approach providing more information that could possibly add to, or take away from, consistency in findings. For example, additional research could address the notion that learners given choice and voice in their learning naturally push templates, prescriptive rubrics, and standardization to the backseat. If learners are given these opportunities, what are the effects on the learner and the learning environment?

Lastly, programmatic and instructor roles change over time impacting the integrated use of the ePortfolio within a significant learning environment. According to Creswell and Guetterman (2019), instructor familiarity with the program of study, students, and college is another limitation to be considered because assumptions could have been made based on our internal knowledge. Further, compartmentalizing ePortfolios into categories such as writing portfolios or assessment portfolios are a common thread at institutions, which ultimately limits the potential that ePortfolios can have on learning and learning environments.

Conclusion

If students perceive technology and the ePortfolio as a rigid tool that is structured and "bolted" onto the learning environment used to assess "checkbox" tasks or to meet the needs of a numerical rubric, little will be gained academically (Mueller & Bair, 2018; Munday, 2017; Papert, 1993). Building on this notion, if instructors view ePortfolios as assessment tools, it is easy to defer to rubrics that measure knowledge and skills and less on transformative learning experiences that align with learning outcomes. Alternatively, there is a positive correlation between instructors who align learning outcomes with student learning experiences shared through an ePortfolio (Scholz et al., 2017). Unfortunately, it is less tedious for instructors to measure knowledge and skills than it is to measure successful outcomes of an authentic learning experience that includes real-world application of ideas. Yet, according to this study, real-world projects that result in authentic artifacts are what many students desire most in their academic learning experiences. It could be that instructors talk themselves out of ePortfolios and genuine learning opportunities because it is unclear how to assess these active learning environments.

Our research, similar to Eynon et al. (2014), suggests we need to find ways to bolster integrative and authentic learning experiences and implementation of ePortfolios as a key to student understanding of the value of ePortfolios. Egan, Cooper-Ioelu, Spence, and Peterson's (2018) study on ePortfolio implementation concluded that the method in which ePortfolios are implemented and embedded within the context of the curriculum and learning environment impacts how and whether students use ePortfolios for learning. Learners must be given opportunities to determine what is important to them and why; essentially, they must be given a voice in the learning process to determine their pathway forward (Landis et al., 2015; Thibodeaux et al., 2019a) and ePortfolios can play an instrumental role in that process if learners are given choice, ownership, and voice through authentic learning experiences.

References

Association of American Colleges and Universities. (2016). *ePortfolios.* Retrieved from https://www.aacu.org/eportfolios

Andrus, S. L., Batchelder, L. W., Benander, R. E., Firdyiwek, Y., Gray, E., Refaei, G., . . . & Zeman, E. J. (2017). In T. Batson, K. Coleman, H. Chen, C. Watson, T. Rhodes, & A. Harver (Eds.), *Field guide to ePortfolio* (pp. 39-45). Washington, DC: Association of American Colleges and Universities.

Amory, A. (2014). Tool-mediated authentic learning in an educational technology course: A design-based innovation. *Interactive Learning Environments, 22*(4), 497-513. doi:10.1080/10494820.2012.682584

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Current Directions in Psychological Science, 84*(2), 191-215. doi:10.1037/0033-295X.84.2.191

Bandura, A. (2000). Exercise of human agency through collective efficacy. *Current Directions in Psychological Science, 9*(3), 75-78. doi:10.1111/1467-8721.00064

Bates, T. (2019). *Teaching in a digital age: Guidelines for designing teaching and learning* (2nd ed.). Vancouver, BC: Tony Bates Associates.

Batson, T. (2016, July 27). Portfolios at a crossroads [Web log post]. Retrieved from http://www.aaeeble.org/blogpost/1008436/173012/ePortfolios-at-a-Crossroads

Buchem, I., Tur, G., & Hölterhof, T. (2014). Learner control in personal learning environments: A cross cultural study. *Journal of Literacy and Technology, 15*(2), 15-53. Retrieved from http://www.literacyandtechnology.org/past-editions.html

Buyarski, C., Oaks, S., Reynolds, C., & Rhodes, T. (2017). The promise of ePortfolios for student learning and agency. In T. Batson, K. Coleman, H. Chen, C. Watson, T. Rhodes, & A. Harver (Eds.), *Field guide to ePortfolio* (pp. 7-13). Washington, DC: Association of American Colleges and Universities.

Creswell, J. W., & Guetterman, T. C. (2019). *Planning, conducting, and evaluating quantitative and qualitative research* (6th ed.). Boston, MA: Pearson.

Dewey, J. (1910). *How we think.* Washington, DC: Heath. doi:10.1037/10903-000

Dewey, J. (1916). *Democracy in education: An introduction to philosophy of education.* New York, NY: Macmillan.

Egan, J. P., Cooper-Ioelu, P., Spence, F., & Petersen, M. L. (2018). The curricular and technological nexus: Findings from a study of ePortfolio implementation. *International Journal of ePortfolio, 8*(2), 127-138. Retrieved from http://www.theijep.com/pdf/IJEP308.pdf

Eynon, B., Gambino, L. M., & Török, J. (2014). What difference can ePortfolio make? A field report from the connect to learning project. *International Journal of ePortfolio, 4*(1), 95-114. Retrieved from http://www.theijep.com/pdf/ijep127.pdf

Glaser, B., & Strauss, A. (1967). *The discovery of grounded theory.* Chicago, IL: Aldine.

Harapnuik, D. (2004). *Inquisitivism as a foundation for web-based instruction* (Unpublished doctoral dissertation). University of Alberta, Edmonton, Alberta.

Harapnuik, D. (2008). Inquisitivism: The evolution of a constructivist approach to web-based instruction. In E. K. Sorensen & D. O. Murchu (Eds.), *Enhancing learning through technology* (pp. 126-153). Hershey, PA: Idea Group.

Harapnuik, D. K. (2015, August 18). *What is an ePortfolio?* [Web log post]. Retrieved from http://www.harapnuik.org/?page_id=5977

Harapnuik, D. K. (2017, October 23). CSLE+COVA vs. traditional [Web log post]. Retrieved from http://www.harapnuik.org/?page_id=7143

Harapnuik, D. K. (in press). *COVA eBook.* Retrieved from http://www.harapnuik.org/?page_id=7291

Hattie, J. (2009). *Visible learning: A synthesis of over 800 meta-analysis related to achievement.* New York, NY: Routledge.

Jonassen, D. H. (2006). A constructivist's perspective on functional contextualism. *Educational Technology Research and Development, 54*(1), 43-47. doi:10.1007/s11423-006-6493-3

Kuh, G. (2016, July 27). *ePortfolio as high-impact practice* [Video file]. Retrieved from

https://www.centerforengagedlearning.org/?s=George+Kuh+on+ePortfolio+as+High-Impact+Practice

Landis, C. M., Scott, S. B., & Kahn, S. (2015). Examining the role of reflection in ePortfolios: A case study. *International Journal of ePortfolio, 5*(2), 107-121. Retrieved from https://www.theijep.com/pdf/IJEP168.pdf

Matthews-DeNatale, G., Blevins-Bohanan, S. J., Rothwell, C. G., & Wehlburg, C. M. (2017). Redesigning learning: ePortfolios in support of reflective growth within individuals and organizations. In T. Batson, K. Coleman, H. Chen, C. Watson, T. Rhodes, & A. Harver (Eds.), *Field guide to ePortfolio* (pp. 14-24). Washington, DC: Association of American Colleges and Universities.

McWilliams, S. A. (2016). Cultivating constructivism: Inspiring intuition and promoting process and pragmatism. *Journal of Constructivist Psychology, 29*(1), 1-29. doi:10.1080/10720537.2014.980871

Mezirow, J. (1997). Transformative learning: Theory to practice. *New Directions for Adult and Continuing Education, 1997*(74), 5-12. doi:10.1002/ace.7401

Mueller, R. A., & Bair, H. (2018). Deconstructing the notion of ePortfolio as a "high impact practice": A self-study and comparative analysis. *Canadian Journal for the Scholarship of Teaching and Learning, 9*(3), 1-16. doi:10.5206/cjsotl-rcacea.2018.3.6

Munday, J. (2017). An embedded ePortfolio in a master's degree: Is it working*? International Journal of ePortfolio, 7*(2), 175-185. Retrieved from http://theijep.com/pdf/IJEP251.pdf

Papert, S. (1993). *The children's machine: Rethinking school in the age of the computer.* New York, NY: Harper Collins.

Piaget, J. (1950). *The psychology of intelligence.* New York, NY: Routledge.

Pink, D. (2009). *Drive: The surprising truth about what motivates us.* New York, NY: Penguin Random House.

Pitts, W., & Lehner-Quam, A. (2019). Engaging the framework for information literacy for higher education as a lens for assessment in an ePortfolio social pedagogy ecosystem for science teacher education. *International Journal of ePortfolio, 9*(1), 29-44. Retrieved from http://theijep.com/pdf/IJEP320.pdf

Poole, P., Brown, M., McNamara, G., O'Hara, J., O'Brien, S, & Burns, D. (2018). Challenges and supports towards the integration of ePortfolios in education: Lessons to be learned from Ireland. *Heliyon, 4*(11), 1-23. doi:10.1016/j.heliyon.2018.e00899

Roberts, P., Maor, D., & Herrington, J. (2016). ePortfolio-based learning environments: Recommendations for effective scaffolding of reflective thinking in higher education. *Educational Technology & Society, 19*(4), 22-33.

Rose, T. (2016). *The end of average: How we succeed in a world that values sameness.* New York, NY: Harper Collins.

Scholz, K., Tse, C., & Lithgow, K. (2017). Unifying experiences: Learner and instructor approaches and reactions to ePortfolio usage in higher education. *International Journal of ePortfolio, 7*(2), 139-150. Retrieved from http://theijep.com/pdf/IJEP264.pdf

Schrader, D. E. (2015). Constructivism and learning in the age of social media: Changing minds and learning communities. *New Directions for Teaching and Learning, 144*, 23-35. doi:10.1002/tl.20160

Steiner, H. H. (2016). The Strategy Project: Promoting self-regulated learning through an authentic assignment. *International Journal of Teaching and Learning in Higher Education, 28*(2), 271-282. Retrieved from http://www.isetl.org/ijtlhe/pdf/IJTLHE2211.pdf

Strauss, A., & Corbin, J. (1990). *Basics of qualitative research.* London, UK: Sage.

Thibodeaux, T. N., Harapnuik, D. K., & Cummings, C. D. (2019a). Student perceptions of the influence of choice, ownership, and voice in learning and the learning environment. *International Journal of Teaching and Learning in Higher Education, 31*(1), 50-62. Retrieved from http://www.isetl.org/ijtlhe/pdf/IJTLHE3199.pdf

Thibodeaux, T. N., Harapnuik, D. K., & Cummings, C. D. (2019b). Student perceptions of the influence of the COVA learning approach on authentic projects and the learning environment. *International Journal of eLearning, 18*(1), 79-101. Retrieved from https://learntechlib.org/p/181977/

Thibodeaux, T. N., Harapnuik, D. K., & Cummings, C. D. (2017). Factors that contribute to ePortfolio persistence. *International Journal of ePortfolio, 7*(1), 1-12. Retrieved from http://theijep.com/pdf/IJEP257.pdf

Thomas, D., & Brown, J. S. (2011). *A new culture of learning: Cultivating the imagination for a world of constant change.* Charleston, SC: CreateSpace.

Watson, C. E., Kuh, G. D., Rhodes, T., Light, T. P., & Chen. H. L. (2016). Editorial: ePortfolios—The eleventh high impact practice. *International Journal of ePortfolio, 6*(2), 65-69. Retrieved from http://www.theijep.com/pdf/IJEP254.pdf

Watty, K., & McKay, J. (2016, October 14). ePortfolios: What employers think. *EFMD Global Focus, 3*(10), 60-63. Retrieved from https://globalfocusmagazine.com/eportfolios-what-employers-think/

Yancey, K. B. (2016, August). *What ePortfolios have to teach (all of) us: A practice of curation, and invisible curriculum, and cataloguing-assessment.* Keynote presentation at the 2016 Annual Meeting of the Association for Authentic, Experiential, and Evidence-Based Learning, Boston, MA.

DR. TILISA THIBODEAUX is an Assistant Professor in the Digital Learning and Leading (DLL) master's program and Director of Digital Literacy of the Reaud Honors College at Lamar University in Beaumont, TX. Her experience has been in the public school system in Florida and Texas for the past 11 years serving as an elementary teacher, district interventionist/coach-NCLB Act, a campus academic coach, and a digital learning coach. Dr. Thibodeaux has a BS in Elementary Education, an MEd in Special Education, and an EdD in Instructional Technology and Distance Education and Educational Leadership. Dr. Thibodeaux helps educators, administrators, and corporations use technology innovation as a catalyst for change within their organizations by setting up significant learning environments that give learners choice, ownership, and voice through authentic learning opportunities. Dr. Thibodeaux is the international practices and pedagogies SIG lead for the Association of Authentic, Experiential, and Evidence-Based Learning ePortfolio group, is the co-developer of the CSLE+COVA Professional Learning Approach and is co-author of Learner's Mindset Discussions videocasts. Since 2015, Dr. Thibodeaux has conducted 47 professional learning experiences with educators all over the world that include academic workshops, faculty retreats, keynotes, and presentations. She has written 23 published works including journal articles, book chapters, a book, and informal publications around ePortfolio and the CSLE+COVA approach.

DR. DWAYNE HARAPNUIK, Clinical Instructor at Lamar university, is a learning theorist who uses media and technology to enhance the learning environment. Dwayne received a PhD in Educational Psychology from the University of Alberta and is a visiting professor and co-developer of the ME in Digital Learning and Leadership at Lamar University. Dwayne recently aided the School of Health Sciences at British Columbia Institute of Technology (BCIT) in developing their Learning Innovation Strategy, and he teaches in the Provincial Instructor Diploma Program at Vancouver Community College. In addition to teaching face-to-face, blended, and online at several institutions for over 20 years, Dwayne's previous academic appointments include Instructional Development Consultant at BCIT, VP Academic at Concordia University of Edmonton, Director of Faculty Enrichment at Abilene Christian University (ACU), and Manager of Educational Technology at Lethbridge College. Dwayne's research focus is exploring how to use choice, ownership, and voice through authentic learning opportunities to create significant learning environments.

DR. CYNTHIA CUMMINGS, Associate Professor at Lamar University, received her EdD in Educational Administration from Lamar University. Dr. Cummings has served as a classroom teacher, administrator, consultant, director, and professor during the past 20 years. In addition to her work with classroom teachers, she has extensive experience with providing professional development for school leaders. She worked with Texas principals and superintendents in a Technology Leadership project funded by the Bill and Melinda Gates Foundation. She was instrumental in establishing the Brazos-Sabine Connection Principal Academy whose goal was to provide school leaders with the skills needed to support effective integration of teaching, learning, and technology. Currently, she is employed as an associate professor in the Educational Administration program at Lamar University in Beaumont, TX. Her responsibilities include writing and teaching online graduate level courses in the master's program. Dr. Cummings research interests include professional development, distance education, and technology integration.

JACKSON DOLCE is a Pre-Optometry/Business Management undergraduate student at Lamar University. Jack became the co-founder and President of the Pre-Optometry Professional Society and serves as a Lamar University Ambassador and College of Business Student Advisory Council member. Currently Jack also serves as the Digital Learning Research Assistant, a ePortfolio Peer Consultant, and as an executive of the ePortfolio Advisory Committee as part of the Reaud Honor's College.

Metacognitive Matters: Assessing the High-Impact Practice of a General Education Capstone ePortfolio

Jeffrey J. Kohler II and Carol Van Zile-Tamsen
University at Buffalo

This manuscript describes the development, execution, and assessment of the University at Buffalo's instructional approach used to teach reflective and integrative learning skills through a general education capstone (i.e., UB Capstone). Early results of the impact of this experience are based on Capstone instructor rubric ratings of Capstone ePortfolios and student responses to an open-ended survey. These results suggest that students are producing high-quality ePortfolios that demonstrate their achievement of key general education learning outcomes, including integrative learning skills. In addition, based on student comments, it is clear that the Capstone experience has a metacognitive impact on student learning; the majority of students completing the Capstone recognize its benefits to their learning and continued growth as learners.

Capstones, or culminating educational experiences, have been used in higher education in the United States since the late 19th century (Hauhart & Grahe, 2015). Capstone experiences are referred to by many different names (e.g., senior thesis, culminating project, senior exhibition), but the purpose remains the same: to provide a guided educational experience where student learning develops into an integrated whole that can be applied easily both to future learning scenarios and out-of-classroom situations (Cuseo, 1998). The general education Capstone at the University at Buffalo is designed to foster integration of the general education experience and application of general education skills to coursework in the major. In this paper, we provide initial evidence of the impact of this general education capstone on integrative learning.

The UB Capstone, first described in Morreale, Van Zile-Tamsen, Emerson, and Herzog (2017), is a major component of the newly revised general education program launched in fall 2016. Known as the UB Curriculum, it transformed general education at UB from the traditional "menu" approach of distributional requirements to an integrated and meaningful Pathway approach. Pathways provide a breadth of knowledge by allowing students to study a topic of interest from multiple disciplinary perspectives. The capstone is the final requirement in which students reflect on and integrate the knowledge they have gained from their Pathways. Students prepare a Capstone ePortfolio to highlight the knowledge and skills developed across the UB curriculum.

The development of the UB Curriculum (described in detail in Van Zile-Tamsen, Hanypsiak, Hallman, Cusker, & Stott, 2017) was faculty-driven and grounded in the work of the Association of American Colleges and Universities (AAC&U) around the design of a liberal education for meaningful, worthwhile learning. It also incorporates high-impact practices (HIPs), evidence-based educational practices that promote college student persistence, learning, and success (Kuh, 2008). The UB Curriculum begins with a first-year seminar, taught by full-time, tenure-track faculty, and concludes with the UB Capstone. Reflective ePortfolios, formally recognized as the eleventh HIP (Watson, Kuh, Rhodes, Light, & Chen, 2016), are introduced in the first-year seminar and provide the mechanism for reflection and integration in the UB Capstone. As the design of this program is described in detail in Van Zile-Tamsen, et al. (2017), the focus in the present paper is to describe the evolution of the capstone from the pilot phase (Morreale et al., 2017) to its present format and to examine the initial evidence of impact.

Literature Review

The UB Curriculum Capstone is the culminating course in the University at Buffalo's redesigned general education curriculum. The general education program redesign includes greater intentionality in coursework offerings and incorporates two of Schneider's (2004) proposed pillars of liberal learning: inquiry and intellectual judgment and integrative learning. The capstone serves as the mechanism through which active integration of general education coursework takes place. The overall objective is to help students develop an integrated, interdisciplinary knowledge base that can be transferred to new situations and more readily available for problem solving and critical thinking activities (Mentkowsky & Sharkey, 2011; University at Buffalo, 2013).

The Nature and Importance of Integrative Learning

Integrative learning has been referred to as an intentionally designed sequence of courses, and as a cognitive process where students actively build connections between topics, courses, disciplines, etc. (Leonard, 2012). Constructivist theory (Bruner, 1996) suggests that merely sequencing related courses in a particular way does not ensure that the cognitive press occurs. Instead, students must be given guided practice

in the process of making such connections across content areas, and they must be motivated to engage in the effort that this cognitive process requires.

Leonard (2012) suggested that integrative learning processes can be arranged along a continuum from basic to sophisticated: application, comparison, understanding context, and synthesis. Further, the design of the learning environment impacts the level of integration that occurs. Specifically, learning activities that include personally relevant coursework, identifying multiple perspectives, encountering conflict, and reconciling conflict promote the cognitive processes underlying integration. However, Leonard (2012) also cautioned that college students' ability to engage in integration parallels their cognitive development; integration improves as students develop their own definitions of knowledge and become independent knowers (Baxter Magolda, 1999).

Huber, Hutchings, and Gale (2005) agreed that integrative learning does not just happen. Not only must students have intentionality and self-awareness in their own learning, but instruction must be delivered in a way that provides scaffolded integration opportunities. Even motivated students will compartmentalize their learning if courses are delivered as discrete chunks with no opportunities to make cross-course connections.

Using the Capstone ePortfolio as the Mechanism of Integration

By design, a capstone is a logical place to support students' integrative work (Hauhart & Grahe, 2015). The general education capstone at the University at Buffalo is designed to foster integration of the whole general education experience and application of general education skills to coursework in the major. While there can be many approaches to integration and integrative learning, at UB, the ePortfolio has become the signature capstone assignment, promoting a scaffolded approach to reflection and intentional integration (Reynolds & Patton, 2014). The ePortfolio becomes the mechanism for integration, ensuring that the connections students make between their general education experience and the skills they have gained through that learning are visible.

Pathways and the UB Curriculum Capstone

The UB Capstone is where students learn to integrate knowledge across courses and experiences to develop a deeper and more meaningful knowledge base. This knowledge is acquired through completion of UB Curriculum requirements, particularly the Pathways courses. Students take two pathways: (a) Thematic Pathway and (b) Global Pathway. These pathways have

been designed to allow students to pursue the disciplinary areas required by the State University of New York (SUNY) for general education.

Students begin by first selecting from a variety of overarching topic areas within each pathway (e.g., business, economy, society). Once they select a topic, they are given lists of courses at the 100-level, 200-level, and 300-level that represent arts, civilization and history, language, humanities, and social sciences. Each pathway must include courses from two of these disciplinary areas. Through the structure of the pathways from broad introductory courses to more focused courses, students reflect upon their education as a continuum rather than a set of discrete courses and deepen their understanding of academic material by examining a single topic across several courses from different disciplinary lenses. Integration of course work, however, is something that requires time and space for reflection and motivation to engage in the integrative metacognitive process (Mentkowski & Sharkey, 2011).

The UB Capstone subsequently provides this time and space as well as guidance in the integration process. Students take the capstone once they have completed all UB Curriculum requirements. Students are also permitted to take the capstone in the same semester that they are enrolled in their final UB Curriculum courses. The typical student will enroll in the capstone course in the second semester of their junior year. The capstone course is taught online via the ePortfolio platform Digication (branded "UBPortfolio") by trained faculty and instructors who serve as mentors to enrolled students as they complete the Capstone ePortfolio.

Evolution of the UB Capstone

The Capstone pilot was launched in spring 2016 with an enrollment of 21 students (Morreale et al., 2017). The focus of the pilot was the ability for the students to successfully engage with the Digication ePortfolio software, developing a schedule for feedback from the instructor to the students, and the course's composition as a 1-credit hour, online-only class. In successive years, changes have been made to the course to accommodate and better match the learning outcomes as the capstone has approached full-scale implementation. For instance, although the course is delivered online, a 90-minute in-person orientation was developed to provide an introduction to the course, familiarize students with their instructors and class expectations, and acclimate them to Digication. Further modifications have been made to assignments to better align with the 1-credit hour mandate and to ensure equity across sections.

These changes have been paired with deliberate efforts by the UB Curriculum office to provide outreach to faculty regarding both the Capstone, Digication, and

Table 1
Capstone Enrollment From Pilot Through Implementation

Term	Classification	Enrollment	Instructors	Sections	Avg. students per section
Spring 2016	Pilot	21	1	1	21
Spring 2017	Launch (transfer students)	53	7	7	8
Summer 2017	Pilot of New Digication	9	1	1	9
Fall 2017	Continuation	79	8	8	10
Winter 2018	Repeaters only	9	1	1	9
Spring 2018	Scale up	501	9	19	26
Summer 2018	10-week session	59	1	3	20
Fall 2018	First group of eligible first-time students	570	14	28	20
Spring 2019	Scale up	1296	19	56	23

guidelines for encouraging students to archive their work. For students, Digication is introduced in the UB Seminar, and they are tasked with locating and preserving artifacts (i.e., representative coursework) from each UB Curriculum course to showcase in the capstone. These outreach efforts have brought considerable benefits to both students and instructors since students begin the course already familiar with the capstone expectation and the procedural basics of Digication and ePortfolios. Beginning in spring 2019, the capstone scaled up as more students became eligible for the course than ever before. Table 1 displays enrollment growth from the pilot to spring 2019.

Learning Outcomes and Assignments

There are six learning outcomes for the UB Capstone which are assessed through weekly assignments and the final Capstone ePortfolio. Upon completion of the UB Capstone, students will be able to: (a) articulate connections across different academic disciplines and perspectives; (b) adapt and apply skills, abilities, theories, or methodologies acquired in one situation to new situations; (c) connect relevant experiences and academic knowledge; (d) demonstrate an evolving sense of self as learner; (e) integrate different forms of communication to enhance meaning (prose, sound, visual media); and (f) apply an understanding of digital citizenship to create an academic capstone portfolio. A course rubric based on these learning outcomes is the measure by which the final ePortfolio is evaluated (available from the first author by request).

Weekly assignments correspond with components of the final ePortfolio:

- A personalized home page that serves as a brief introduction to the student, his or her studies, general interests, and career goals.

- A learning philosophy statement which serves as a critical reflection upon the self as learner and how a student has evolved or changed as a learner during his or her tenure at UB.
- A showcase of UB Curriculum artifacts where a student provides representative coursework, explains its relevance, and justifies selection of the specific artifact.
- Two pages devoted to "beyond the classroom" activities (e.g., engagement with the arts, community volunteer work, internships, club and athletic activities, alternate break or study abroad experiences) where students connect learning that occurs inside and outside of the classroom.
- Two reflective essays, one focusing on the Thematic Pathway and the other on the Global Pathway. This culminating section of the capstone demands a rigorous application of integrative thought, asking students to examine a complex issue from multiple theoretical perspectives or to adapt and apply skills to solve a complex problem.

Instruction

Instructional staffing in the most recent semester included one capstone clinical instructor, 10 teaching assistants, and eight adjunct instructors (i.e., internal, extra-service candidates serving full-time in other departments on campus). Each teaching assistant and adjunct instructor was responsible for two sections (up to 66 students) of the UB Curriculum Capstone course. Students in each section were from a variety of majors. The instructor served as a mentor and facilitator in helping students to conceptualize and construct a holistic, reflective ePortfolio. The facilitation of integrative learning and reflective writing was paramount. Students were encouraged to consider the

ePortfolio as a comprehensive reflection of their learning across not only general education coursework but throughout their entire lives—students recalled relevant experiences, skills acquired, and challenges faced both within and beyond the UB curriculum.

The capstone has been increasingly standardized to provide greater equity across sections. Standardized elements include a uniform schedule, weekly outreach messages to students, portfolio guides, and instructional materials. The implementation of a standardized course coupled with the creation of a repository of instructor information and additional materials has greatly reduced the overhead for instructors. With the course's exponential growth, these initiatives free instructors to focus on ePortfolio feedback and mentoring activities.

As the capstone has evolved, an emphasis has been placed on diversifying the disciplinary specialties of the instructors to better reflect the student body. Instructors now hail from a variety of majors, such as comparative literature, curriculum and instruction, English, foreign and second language education, history, linguistics, media study, mental health counseling, nursing, and social work. The nature of the Capstone affords instructors the unique opportunity to engage with students from each and every major offered at UB.

Training

Capstone instructors are selected based on demonstrable teaching skills in online environments. Their training emphasizes a mastery of Digication, which allows them to adeptly field technical questions and issues. The pedagogical emphasis is on efficacy in student engagement. Members from various support units (e.g., the Teaching and Learning Center and University Libraries) provide specialized training to instructors in the weeks prior to the beginning of the semester. These specialized trainings focus on deepening the instructors' pedagogical knowledge in online teaching as well as anticipating issues that arise in the ePortfolio (e.g., digital copyright and academic integrity). Instructors are familiarized with the standardized rubrics for each assignment as part of the training, including a discussion of how rubrics are tied to the learning outcomes. Capstone instructors meet on a biweekly basis where discussion about upcoming assignments is the focal point. In particular, model examples of student work from previous semesters helps establish a baseline for consistent grading across sections. An anthology of best practices containing feedback from previous capstone instructors is updated after each academic year, and this document is disseminated to new instructors to aid them in the day-to-day operations of the capstone. Annual evaluations are conducted at the end of each academic year to gauge

areas of strength and weakness for each instructor, and to promote their professional development.

ePortfolio Template

An ePortfolio template has been created to provide students with a basic structure for the successful construction of the final ePortfolio. The template is preloaded with prompts, instructional content, and other information to assist the student in both the technical and substantive generation of their ePortfolio and its content. Students are required to customize the ePortfolio template while keeping an eye toward accessibility and readability. They are also required to demonstrate multimodal communication—their ability to integrate design features with the message of their textual content to reinforce and amplify that message. The Digication platform has an almost limitless capacity for importing content of virtually any type, and thus students may personalize their ePortfolios to suit their preferences.

Employability Skills

The original UB Capstone design committee incorporated goals related to student benefits that transcend the stated learning outcomes of the course. In particular, students are encouraged to consider the value of reflection and the insights shared in the process of constructing their ePortfolios in order to highlight marketable skills acquired as part of their general education. The portability of the Digication platform allows students to retain control over their data in perpetuity. Students are encouraged to either adapt their Capstone ePortfolios or to develop a tailored ePortfolio for the job market. The transferable skills they acquire through a quality general education provide them with considerable flexibility in their employment potential, and the ePortfolio is promoted as an ideal method for recent graduates to demonstrate these skills. Similarly, the reflective, integrative learning accomplished through the Capstone ePortfolio provides students with an excellent platform to build upon for application to graduate schools, grants, and fellowships.

Transfer-Specific Issues

One particular area of attention has been the transfer student experience in the capstone (and, more generally, throughout the UB Curriculum). Many of our transfer students are high-credit transfer students. A deliberate effort has been made to make sure transfer students felt the course was relevant to their unique experiences, just as much as it would be to a first-time UB student. Another issue for transfer students is that coursework may have been completed many years prior to

enrollment at UB. As a result, specific recall of coursework and its details can prove difficult. At the end of the day, not every course may prove meaningful nor may every student have total recall of their time in that particular class. It does not diminish the value of the exercise, and collectively, students are able to holistically reflect on their general education coursework.

Assessing the Impact of the UB Capstone on Student Growth and Achievement

The capstone was designed with the very specific purpose of fostering reflection and integration of the general education learning experience, and it is necessary to examine both objective data regarding students' achievement of these learning outcomes and their perceptions of the impact of the capstone experience on their learning. To understand the degree to which the goals of the capstone have been achieved, we examined student achievement data based on rubric scoring of their Capstone ePortfolios. We also measured student perceptions of the capstone experience as expressed in an open-ended survey to determine if the level of desired integrative learning and self-reflection was evident in their work.

Method

UB is the largest, most comprehensive institution in the SUNY system and a member of the Association of American Universities (AAU). UB currently enrolls 21,000 undergraduates in over 100 degree programs. The undergraduate population consists largely of students studying in STEM or the health sciences and is 56.7% male and 43.3% White. Based on the 2017-18 Common Data Set (University at Buffalo, 2017), the four-year graduation rate was 58%, and the first- to second-year retention rate was 86%. Although there have been gains in the four-year graduation rate over the last 10 years, the retention rate has remained fairly constant.

Rubric results were compiled for the 502 students enrolled in the UB Capstone in spring 2019. Of these students, 49.0% were female and 92.0% were domestic students. Of the domestic students, 25.5% were from underrepresented groups: 12.6% African American, 5.8% Hispanic, and 1.0% Native American/Alaskan Native. At the university, Asian students are not considered underrepresented and comprised 12.6% of the domestic students enrolled in the Capstone. Of the 38 international students, 26.3% hailed from China, 21.2% from India, 15.8% from South Korea, 7.9% from Taiwan, 5.3% each from Japan and Hong Kong, and 2.6% each from the Czech Republic, Jordan, Kenya, Malaysia, Myanmar, Norway, and Turkey.

The majority of students enrolled in the Capstone in spring 2019 were transfer students (79.3%). Of the

remaining students, 18.9% enrolled at UB as first-time freshmen and 1.8% were re-enter students (i.e., those who had been enrolled at UB previously, left for some time, and then returned). Nearly a quarter of the students (21.9%) were first-generation students. A small number of these students (3.2%) were enrolled in the Educational Opportunity Program (EOP), 5.4% were in the Honors College, and 2.4% were athletes. With regard to final grades in the capstone course, 81.5% received grades of A or B, 9.0% received C grades, 4.4% received D grades, and the remaining 4.6% failed or resigned from the course. Most were enrolled in the capstone as seniors (77.3%) while 20.5% were juniors and 2.2% were sophomores. The anonymous open-ended survey was completed by 109 of the enrolled students (21.7%).

Data Collection and Analysis Procedures

Throughout spring semester, students completed their Capstone ePortfolios in Digication. At the end of the semester, they used Digication to submit their final ePortfolios. The instructors used the common rubric to score submitted ePortfolios according to the achievement of each of the course learning outcomes. These rubric scores reflect the objective measure of student achievement of the capstone learning outcomes. The achievement levels for each rubric row (e.g., each learning outcome) were as follows: 0 (*no evidence*), 1 (*emergent*), 2 (*proficient*), 3 (*fully competent*), 4 (*exemplary achievement*). All rubric scores were exported from Digication and summarized using SPSS. The results for the first three learning outcomes relating specifically to integrative learning and developing as a learner are presented in this paper.

Students' perceptions of the impact of the capstone on their learning were collected via an open-ended online survey. At the end of the spring semester, e-mail invitations were sent to all students enrolled in the capstone requesting that they complete the survey. Students were informed that the purpose of the survey was for assessment of the capstone and the results would be completely anonymous and used only to help improve the capstone experience. The survey itself consisted of five items, but only data from three are analyzed in this study:

- What have you learned about yourself as a learner through your experience in the Capstone?
- Describe any new understandings you have developed about general education courses you have taken through your completion of the Capstone ePortfolio.
- What do you see as the most valuable part of general education coursework?

Qualitative data analysis of responses to these three questions follows the steps provided by Van Zile-Tamsen (2011). The data was initially output to an Excel workbook and separated by survey question into separate tabs. Within each tab, responses were sorted alphabetically by the first word of the response to facilitate coding of like responses. In this manner, all of the "N/A," "everything," and "nothing" responses were easily grouped. After an initial read-through of all responses, an investigator assigned themes to responses (Gibbs, 2007). In some cases, the response represented a single idea, but in other cases, responses were more complex and referenced two or more discrete concepts with multiple themes assigned.

Once initial coding was complete, the second investigator reviewed all coding to indicate agreement/disagreement with initial themes. In cases where there was disagreement, the two investigators discussed responses until they came to consensus regarding the most appropriate theme or themes (Flick, 2007). Once all disagreements were resolved, higher-order theme analysis was completed and the results were organized into tables (Miles & Huberman, 1993).

Results and Discussion

Table 2 provides the results of the rubric scoring of ePortfolios, which show that the enrolled students are successfully achieving the learning outcomes of the course. This rubric is based largely on AAC&U's (2009) Integrative and Applied Learning VALUE Rubric, while being tailored to the specific outcomes relevant to the UBC399 Capstone. The first outcome, articulate connections across academic disciplines and perspectives, specifically addresses integrative learning.

The results of the rubric scoring of final ePortfolios are very encouraging, with 78.7% of spring 2019 capstone students categorized as fully competent or exemplary. Further, 81.8% of the students were fully

competent at connecting relevant experiences and academic knowledge. This suggests that these students gained skills in the area of transferring knowledge from one situation to another, often between out-of-classroom experiences and things they learned in coursework.

The results of the theme analysis for Item 1, "What have you learned about yourself as a learner through your experience in the Capstone?", are shown in Table 3. Of the 109 students who responded to this item, 84 (81.0%) indicated that they learned something, while 24 (19.0%), indicated that they learned nothing and the capstone was either meaningless or a waste of time. The 84 students who indicated that they learned something generated 122 discrete comments to describe what they learned, which were separated into three overall themes of learning: learned about myself (68 comments; 56% of the total 122 comments generated); learned about the educational process (26 comments for 21% of the total 122 comments); and the capstone structure itself had an impact (28 comments for 23% of the total 122 comments).

Much of the feedback regarding the capstone highlighted previously unrecognized course connections (29%). The UB Curriculum is designed to curate experiences across disciplines—particularly in the pathways component of the curriculum—where coursework is organized along particular themes. Students have the freedom to select pathways topics that are of interest to them; the courses are not tied to their major. The pathways encourage students to examine big ideas (e.g., business, economy, and society; human nature; social justice) in the capstone, completing integrative essays that prompt students to identify and determine the significance of these connections. Instructors are not tasked with highlighting these connections in their courses, but rather, these ideas emerge organically.

Table 2
Achievement of Course Learning Outcomes (Percentages of Rubric Scores)

Learning outcome	Not submitted	No evidence	Emerging	Proficient	Fully competent	Exemplary
Articulate connections across different academic disciplines and perspectives.	4.0	0.2	11.6	5.4	19.7	59.0
Connect relevant experiences and academic knowledge.	4.0	0.2	10.6	3.4	16.1	65.7
Demonstrate an evolving sense of self as learner.	4.0	0.2	11.4	4.8	17.9	61.6

Table 3
What Students Have Learned

Theme	Sub-theme	Exemplars
Capstone had impact (28, 23%)	Fostered course connections (8, 29%) Self-reflection (8, 29%) Writing skills (3, 11%) Learning skills (3, 11%) Professional development (2, 7%) Critical thinking (1, 4%) Intellectual diversity (1, 4%) Digital citizenship (1, 4%) Technological literacy (1, 4%)	"I've learned that I can make connections between things that are seemingly unrelated. I also learned to become a better writer by making those connections and tying ideas together" "How to investigate presented facts' authenticity and how to build on and show my experience across courses through resumes and portfolios." "I have gone through all my past courses and that has given me ideas on what to put on my resume."
Learned about myself (68, 56%)	Metacognitive awareness (29, 43%) Evolution of self as a learner (22, 33%) Learning skills (5, 7%) Importance of effort (4, 6%) Fostered course connections (3, 4%) Intellectual diversity (1, 2%) Role of creativity (1, 2%) Support systems (1, 2%) Digital citizenship (1, 2%)	"I have reflected upon all of the skills and techniques that I have harnessed and used through my career." "As A [*sic*] learner, I noticed that I should take more time to consider things other than assignments and exams and note the importance of digital citizenship." "I have learned that I have evolved tremendously as a learner throughout the years. My study habits, note-taking and listening skills have all changed for the better and I can really see that by completing capstone."
Learned about education (26, 21%)	Developed course connections (14, 54%)	"That all of the classes that I have taken all have seemed very different, but . . . I saw just how interconnected everything is to each other." "I have learned that all my classes . . . have helped me to further develop my studies as a student. I have always enjoyed learning but having the ability to reflect on everything I have learned . . . enabled me to appreciate everything I have . . . learned these last 2 years."

Students also engage in self-reflection as a result of the capstone (also at a rate of 29% of respondents). In some cases, students utilize the capstone as a means of assessing their prior coursework as it relates to their fitness for entering the job market. While these types of practical connections are not discouraged, the capstone strives for deliberate metacognitive growth, where students are examining transferable skills acquired across the general education curriculum. Feedback touching on the discernment of authenticity stands out for this very reason: no specific course may have explicitly addressed this concept, yet the student has added this concept to their toolbox and recognized its presence as a result of the capstone.

This leads to the second category: learned about myself. This metacognitive awareness of transferable skills is not a given. While many students may feel comfortable engaging with their academic discipline, it is of greater significance to UB Curriculum that graduates are emerging as well-rounded individuals who have acquired meaningful skills beyond their chosen discipline. The goal of the UB Curriculum—and any general education worth its salt—must be to produce these types of graduates, and it appears that the capstone has confirmed our students are learning about themselves in significant ways.

The final category of responses was that students learned about their education. While the first two categories of responses dealt with metacognitive skills,

responses to this question were oriented more closely to the value of the general education program as a whole. Interconnectivity is placed very highly amongst the exemplars (54%), but the value of the coursework itself (31%) is a remarkable and pleasing development. Since we know that many students are inclined to consider their general education coursework as mere requirements to be completed, this feedback informs us of the inherent value to students of general education coursework itself, as well as the efficacy of UB Curriculum's uniquely curated program.

The results of the theme analysis for Item 2, "Describe any new understandings you have developed about general education courses you have taken (and your learning in those courses) through your completion of the Capstone ePortfolio", are shown in Table 4. Of the 100 students responding to this item, 71 (71.0%) indicated that they had learned something, while 29 (29.0%), indicated that they learned nothing. The 71 students who indicated that they had learned something generated 93 discrete comments to describe what they had learned. Of these 71, five students indicated that the benefits they identified were completely unexpected. The themes that emerged from these comments are shown in Table 4.

Identification of course connections was an essential element for these respondents. Assignments throughout the capstone are intended to foster these connections. First, students identify representative coursework (i.e., artifacts) from each of their pathways courses. These artifacts are accompanied by criteria statements that detail the purpose and nature of the artifact and its larger significance. Then, students compose two integrative essays that require them to identify any connections—or disconnections—between their pathways courses. Where general education coursework might seem incongruent in a traditional model, in the UB Capstone, student essays consistently articulate the combined relevance of their Pathways courses in ways that make the classes significantly more meaningful.

Another portion of the integrative learning essays—and the larger ePortfolio—is to identify applicable, transferable skills gained throughout the pathways coursework. A total of 24% of our respondents indicated they were able to identify learning skills and strategies through the completion of the Capstone ePortfolio. Again, removing the idea of general education coursework from the realm of the incongruous into a more cohesive collection of substantive courses is imperative in the UB Curriculum. Evidence that students identified valuable skills (e.g., argumentative writing, source evaluation and discernment, time management) across the UB Curriculum is validation for the program's efficacy. A total of 15% of respondents indicated that building a

knowledge base was a learning benefit of the capstone. A total of 13% responded with building transferable skills, which further suggests that the capstone helped students to engage in valuable metacognitive exercises relevant to their futures. Recognition of their qualifications and talents is vital for students in their pursuit of relevant opportunities.

The results of the theme analysis for Item 3, "What do you see as the most valuable part of your general education course work (those taken at UB and at other institutions)?", are shown in Table 5. Of the 101 students who responded to this item, 84 (83.0%) identified at least one valuable aspect of their general education programs and 17 (17.0%) indicated that there was no value. The 84 students who provided at least one aspect generated 116 discrete comments. Please note that because so many identified themes emerged for this question, only those with a frequency of 5% or greater are included in the Table 5.

With the capstone's emphasis on reflection, it is gratifying to see that the most frequent response centered on recognition of broadened interests and perspectives. Construction of an ePortfolio allows students to look back on their coursework and apply it moving forward. This metacognitive exercise helps students recognize the inherent value of their general education courses but also informs us on the efficacy of those courses toward imparting a strong foundation of intellectual diversity and appreciation in UB students. Similarly, in assessing the courses which make up the UB Curriculum, the quality of general education should also be measured based upon the ways in which the courses prepare students for real world applications both within and beyond their majors: 16% of respondents felt that the UB Curriculum provided them with foundational knowledge they could build on through their major courses. Acquisition of foundational skills (10%) was also a common theme. The UB Curriculum's deliberate grouping of foundations coursework, courses in communication literacy, math and scientific literacy, and diversity learning, appeared to help students distill transferable skills.

Another remarkable category was the development of learning strategies throughout UB Curriculum coursework. In the Capstone, while all of the assignments engage students in reflection, one particular assignment focuses on learning strategies, the Learning Philosophy Statement. Students reflect in 500 or more words to analyze the ways in which they learn, their ideal learning conditions, the evolution of their learning over time, and the implications for 21st century technology on their learning. Often students choose to deliberately examine their experiences in the UB Curriculum itself, while others take a broader approach by delving into their learning since early childhood and extending to their present-day

Table 4
New Understandings of General Education

Theme	Exemplars
Better understanding of the curriculum (5, 5%)	"It allows me to acquire different learning experiences and knowledge, and it helps my ability to think clearly, speak and write effectively, and act wisely."
Building a knowledge base (14, 15%)	
Building transferable skills (12, 13%)	"I have been able to understand the importance of taking classes unrelated to my major. Not only have I learned about things such as diversity and perspective taking but I have also developed a new approach to learning. General education courses provide me a variety of approaches to different world views on things such as English, math, and art."
Developing connections between courses (26, 28%)	
Developing learning skills and strategies (22, 24%)	
Diversity learning (9, 10%)	"I used to think general education courses were fillers just to take and earn credits towards your degree, but now I understand the purpose of them. Which is to broaden your communication and general scope through the arts and sciences."
Fun/enjoyable (3, 3%)	

Table 5
Most Valuable Part of General Education Course Work

Theme	Exemplars
Broadening of interests and perspectives (23, 20%)	"The most valuable part that I have seen is my knowledge and understanding of those general education topics. I need to keep an open mind and learn as much as I can even though it is not in my concentrated field of study."
Foundational knowledge (19, 16%)	"The most valuable part of my general education coursework was that it prepared me for my coursework in my degree's area."
Foundational skills (12, 10%)	"The most valuable part is the expansion of my knowledge. Various courses provided a wide range of concepts, and these concepts built the foundation for me as a learner."
Applied learning (11, 9%)	"Many of these courses relate to the current issues. For instance, my global gender study class talks about the negative effects of current global integration. So, these courses help me become more aware of the current world issues."
Development of learning strategies (9, 8%)	"The seminar class I took was a very important class because the instructor had a very distinct perspective on learning. This made me stretch some muscles which I would've never used in high school."
Intercourse connections and connections to major (8, 7%)	"The most valuable classes I have taken are the ones that overlap with my major requirements."

methodologies. Students also consider the evolution of learning from their childhood experiences to classrooms which feature the inclusion of technology. Resulting reflections often include the varied quality of information available from internet sources and the importance of solid research skills.

Conclusions

Based on students' achievement of the capstone learning outcomes as measured by instructor-completed rubrics, results suggest that students engaged in the desired level of integrative learning. They created a broader and more in-depth understanding of their selected pathways' topics through the exploration of course connections in their Pathways Essays. Student ePortfolios also provided evidence that UB students related events and situations outside of the classroom to things they learned in the classroom. The ability to transfer learning suggests that they will be well-positioned upon graduating from their academic programs to enter the workforce or apply to graduate study. Based on their comments to the open-ended survey items, students recognized the development of their integrative learning skills as well as the ability to transfer knowledge and skills across situations.

Summary of Progress

The capstone—and the redesigned UB Curriculum—represents a sea change in the conceptualization of undergraduate general education. By leveraging the high-impact practices of integrative and reflective learning alongside the ePortfolio, purposeful general education promoting successful outcomes independent of major, discipline, or career path is achieved. The capstone has evolved from a fledgling requirement available only to high-credit transfer students into a scaled course that expects an enrollment of over 1,300 students per semester. The feedback received from students has helped the capstone evolve into a more meaningful and accessible course for students from all majors. Assessment data indicate that the capstone is indeed fulfilling its goal of integrative and reflective learning, and that students gain an appreciation for both general education as a whole and the transferable skills that they have acquired.

Recommendations for Improvement

As the course continues to grow in size, it is essential that the quality of instructional staff of the capstone be maintained. So far, we have drawn from a large pool of graduate students and current UB faculty and staff to teach the capstone. The capstone has

gradually become a familiar concept to the larger UB community, making it appealing to potential instructors as a unique teaching opportunity. It does require specific pedagogical skills, however, and it will be important to maintain instructional quality.

Another topic for exploration is the delivery of feedback and, in particular, managing the workload for the instructors. Current projections have the section sizes enlarging to 100 students, rendering the current feedback model burdensome for instructors and well beyond the expectations of a 1-credit hour course. The streamlining of the course has helped ease the workload thus far. Alternative feedback models (e.g., greater usage of peer feedback) are being considered. Pilots in this vein are planned for future capstone sections.

One point of attention has been the number of respondents who indicated they found no learning benefit from the course. Given the reflective nature of the course, some students may not be able to recognize these benefits until some time has passed and they enter into the next phase of their lives, be it graduate school or entering the professional world. At 1-credit hour with a modality focused more on mentoring than on instructing, this seems like an expected (though not acceptable) rate of students. Many students arrive at the capstone feeling as if they are uncertain about the course and its purpose; by the completion of the course, their reflective writing indicates that they have indeed identified (if not recognized outright) the capstone's value. In revising the course, we have focused our attention on greater outreach to students prior to the course (in the other components of the UB Curriculum) to better prepare them for the class. We have also focused our attention during the course, making sure to describe the relevance of each assignment as it relates to their experiences and focusing on the integrative idea behind the UB Curriculum as a whole.

As the capstone continues to advance to scale, additional ways of satisfying the learning outcomes of the course beyond reflective writing should be explored. This is not to say that reflective writing must be eliminated; it is an essential element of the ePortfolio concept and what makes it invaluable. However, with students of all majors, disciplines, academic and professional trajectories required to complete the course, opening up the Capstone ePortfolio to the full multimodal potential of the platform will expand the opportunity for reflection. For example, a student in media studies may demonstrate reflective and integrative learning utilizing a short film as an alternative to a formal essay.

Orientation to Digication also needs to be reviewed. The initial approach has been to provide in-person orientations during the first week of the semester. This was necessary as the software, while

largely intuitive, had proven to be a common stumbling block for students who had never used it. With the course enrollment expected to double from the Spring 2019 to Fall 2019, a revised delivery model must be implemented to help acclimate students to the unique aspects of the capstone and set them on the correct path to using the software reliably.

References

Association of American Colleges and Universities (AAC&U). (2009). *Integrative and applied learning VALUE rubric.* Retrieved from https://www.aacu.org/value/rubrics/integrative-learning

Baxter Magolda, M. B. (1999). *Creating contexts for learning and self-authorship: Constructive-developmental pedagogy.* Nashville, TN: Vanderbilt University Press.

Bruner, J. (1996). *The culture of education.* Cambridge, MA: Harvard University Press.

Cuseo, J. B. (1998). Objectives and benefits of senior year programs. In J. N. Gardner & G. Van Der Veer (Eds.), *The senior year experience: Facilitating integration, reflection, closure, and transition* (pp. 21-36). San Francisco, CA: Jossey-Bass.

Flick, U. (2007). *Managing quality in qualitative research.* Thousand Oaks, CA: Sage.

Gibbs, G. (2007). *Analyzing qualitative data.* Thousand Oaks, CA: Sage.

Hauhart, R. C., & Grahe, J. E. (2015). *Designing and teaching undergraduate capstone experience*s. San Francisco, CA: Jossey-Bass.

Huber, M. T., Hutchings, P., & Gale, R. (2005). Integrative learning for liberal education. *Peer Review*, *7*(4), 4-7. Retrieved from https://www.aacu.org/publications-research/periodicals/integrative-learning-liberal-education

Kuh, G. D. (2008). *High impact practices, what they are, who has access to them, and why they matter.* Washington, DC: Association of American Colleges and Universities.

Leonard, J. B. (2012). Integrative learning: A grounded theory. *Issues in Integrative Studies, 30*, 48-74.

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis.* Thousand Oaks, CA: Sage.

Mentkowski, M., & Sharkey, S. (2011). How we know it when we see it: Conceptualizing and assessing integrative and applied learning in use. *New Directions for Institutional Research*, *149*, 93-107. doi:10.1002/ir.383

Reynolds, C., & Patton, J. (2014). *Leveraging the ePortfolio for integrative learning: A faculty guide to classroom practices for transforming learning.* Sterling, VA: Stylus.

Schneider, C. G. (2004). Practicing liberal education: Formative themes in the reinvention of liberal learning. *Liberal Education, 90*(2), 6-11.

Morreale, C., Van Zile-Tamsen, C., Emerson, C. A., & Herzog, M. (2017). Thinking skills by design: Using a capstone ePortfolio to promote reflection, critical thinking, and curriculum integration. *International Journal of ePortfolio, 7*, 13-28. Retrieved from http://www.theijep.com/pdf/IJEP245.pdf

University at Buffalo. (2013). *Preliminary report to the curriculum and assessment task force.* Buffalo, NY: Author.

University at Buffalo. (2017). *Common data set, 2017-18.* Buffalo, NY: Author.

Van Zile-Tamsen, C. (2011, December). *What do I do with it now? Beginning and advanced analysis techniques for open-ended survey data.* Paper presented at the Northeast Association of Institutional Research, Boston, MA.

Van Zile-Tamsen, C., Hanypsiak, K., Hallman, L., Cusker, E., & Stott, A. M. (2017). The capstone ePortfolio: High impact practice for general education. *AAEEBL ePortfolio Review, 1*(3), 24-35. Retrieved from https://aaeebl.org/2020/02/09/aaeebl-eportfolio-review/

Watson, C. E., Kuh, G. D., Rhodes, T., Light, T. P., Chen, H. L. (2016). Editorial: ePortfolios—The eleventh high impact practice. *International Journal of ePortfolio, 6*(2), 65-69. Retrieved from http://www.theijep.com/pdf/IJEP254.pdf

---

JEFFREY J. KOHLER II is the Capstone Clinical Instructor for the UB Curriculum office at the University at Buffalo. His current work is focused on online teaching pedagogy and the implementation of high-impact practices. In addition to the UB Capstone, he also teaches first-year seminars for incoming transfer students, as well as various courses in his primary field of history. Specializing in 20th century politics in the United States, his prior research examined the work of Robert F. Kennedy as Attorney General in the 1960s and subsequent federal scrutiny on organized crime. He is an alumnus of UB, having earned his PhD in History in 2013.

CAROL VAN ZILE-TAMSEN is the Assistant Vice Provost for Educational Effectiveness and Adjunct Associate Professor in Counseling, School, and Educational Psychology at the University at Buffalo. Her primary focus involves Student Learning Assessment, Psychometrics, and using data for improvement efforts. She teaches psychometric theory for graduate students from across the university as well as first-year seminars for incoming freshmen and transfer students. She is an alumnus of UB, having earned her doctorate in Educational Psychology in 1996.

Review: *ePortfolio as Curriculum: Models and Practices for Developing Students' ePortfolio Literacy* (Stylus, 2019)

Erin Horan
American University

Since the start of ePortfolio use in higher education, research has come a long way to not only include testimonials and anecdotal reports about their importance and efficacy, but also to include research such as case studies and studies on the effect of ePortfolio for student attainment of learning outcomes. *ePortfolio as Curriculum: Models and Practices for Developing Students' ePortfolio Literacy*, edited by Kathleen Blake Yancey (2019), is a compilation of case studies that provide anecdotal and research evidence to support the use of ePortfolios as a curriculum. This publication showcases the advantages of implementing ePortfolio throughout students' higher education careers to encourage metacognitive thinking; reflection; and past, current, and future identity development. In addition to the research supporting ePortfolio as curriculum, the authors throughout this book provide several examples and concrete advice for those interested in developing their own ePortfolio program. This review discusses three major themes that the authors focus on: guiding the reflection process, determining the audience for the ePortfolio, and considerations for managing an ePortfolio program. Publisher: Stylus (Sterling, VA, 2019). ISBN: 9781620367605. $29.95 (U.S.). 286 pages.

With *ePortfolio as Curriculum: Models and Practices for Developing Students' ePortfolio Literacy*, Kathleen Blake Yancey (2019) compiled a diverse set of first-hand research and experiences for using ePortfolios in higher education. The faculty, staff, and administrators who authored each chapter provide numerous examples of ePortfolio programs at various points in the ePortfolio process; some were just starting out, some were growing, and others were conducting research on their programs to continue to inform and improve their practices. The variety of experiences makes this publication a valuable resource for all, from experts in the ePortfolio world to novices just getting started.

Yancey introduced the topic by explaining that institutional use of ePortfolio falls on a continuum. In some cases, ePortfolios are used as a "wrapper," where the ePortfolio is solely a place to compile coursework and assignments to demonstrate learning. This is a helpful first step when engaging in the ePortfolio process because, in order to reflect on learning, it is necessary to first compile work to reflect upon. The downside of the "wrapper" model is that this process of creating an ePortfolio does not lead to any additional learning beyond what was learned during the creation of the original work sample.

On the other end of this continuum, *ePortfolio as Curriculum* focuses on engaging students in the process of making the ePortfolio with explicit instructions, questions, and prompts for reflection. As Rhodes (2019) stated in his foreword, this use of ePortfolio is a clear example of a meta high-impact practice due to the process of thinking through all of the learning from a specific course or an entire program of study, and purposefully making connections between the content and how learning has prepared students for the future. The concept of ePortfolio as curriculum not only draws from all learning that takes place during higher education, including learning both inside and outside of the classroom, but provides students with a program that supports learning during the process of creating the ePortfolio.

The case studies selected for inclusion in *ePortfolio as Curriculum* provided valuable information for implementing ePortfolio as a curriculum, with specific steps faculty can follow to successfully engage in this process. This review discusses three themes. First, encouraging reflection is touted as essential within each case study, with many chapters including descriptions and resources for others to encourage reflection as students were creating their ePortfolios. A second theme is the focus on audience, including determining the intended audience, identifying the unintended audience, and clarifying how to develop an ePortfolio that meets student goals for communicating with the audience. And third, there are several examples of logistical advice, such as structuring your course to include ePortfolio development and how to get an ePortfolio program started at your institution. These key themes provide valuable advice to readers so they can understand and draw from the successes and challenges of the authors of this book.

Guiding the Reflection Process

The importance of reflection during ePortfolio construction was evident throughout the publication, as many of the case studies include examples of how to guide reflection through questions, prompts, interviews, and peer and self-reviews. Burns and Thompson (2019) provided the prompts that they gave to students throughout the ePortfolio construction process, which were intended to make the reflection process meaningful rather than tedious and difficult. They used

three deceptively simple questions to guide the process: "1. What are you doing (or being asked to do)? 2. What results do you expect? 3. How can you improve it?" (p. 38). The authors pointed to additional literature that has shown how the use of pointed, guiding questions allows the ePortfolio process to be a self-regulated learning process (e.g., Yang, Ngai, & Hung, 2015). To demonstrate the effectiveness of their ePortfolio curriculum, Burns and Thompson (2019) reported that the students they worked with had used their ePortfolios during job interviews and other professional development opportunities.

James, Scida, and Firdyiwek (2019) also described the importance of teaching students how to reflect productively. Their case study examined students in language learning programs (i.e., beginning and intermediate French and Spanish). Language learning courses provide students a unique opportunity to reflect not only on language skills obtained but also on cultural competence. James et al. (2019) required both a pre-reflection and post-reflection, after which students would evaluate together in order to reflect on the entire ePortfolio creation process. This multi-stage process goes a step further than other processes by requiring students to reflect on their reflection, which encourages the development of metacognitive thinking skills we all strive for our students to gain. Their chapter appendix (Appendix 3A) generously provides the specific prompts and questions they used for the initial, intermediate, and final reflections. In addition to the ample information about the processes they engaged in, the authors administered online surveys and conducted focus groups with instructors and students and analyzed students' ePortfolios. Overall, they found their process for creating ePortfolios enhanced students' meaning making of the class content as well as developed metacognitive skills for students to better understand how their learning grew. James et al. (2019) also reported that students found the reflection helpful for assessing points of improvement and areas of weakness within the ePortfolio.

As a final example, though as mentioned the importance of reflection was ubiquitous throughout the publication, Matthews-DeNatale (2019) used curriculum theory to examine students' experiences during an online Master of Education program. As part of this program, students were required to keep an ePortfolio in which they saved coursework from all courses, ideally signature work, accompanied with a reflection component. Matthews-DeNatale (2019) pointed to Pinar and Grumet's (1976) narrative approach when discussing curriculum theory, specifically, their encouragement to use curriculum not just as a noun, as it is typically used, but as a verb, something that is acted on (i.e., through reflection). After interviewing alumni from the program,

Matthews-DeNatale (2019) reported that students appreciated courses that encouraged them to maintain their ePortfolio during their program by compiling content (e.g., reflections, syllabi) rather than having to scramble to compile documents at the end of the program. Specifically related to reflection, students reported it was difficult to make connections to prior learning by the time they got to their capstone course when they created the final ePortfolio product. Reflection throughout allowed students to better understand not only what they learned but also how what they learned applied to their future. These student testimonials show the importance of reflection when creating ePortfolios and provide evidence that, unless we require students to be mindful about reflecting, reflection may not happen.

Upon graduating from a college or university, many students are unable to describe what they learned in college, an issue not only for the institution but also for students applying for jobs. Unless they can describe what they learned and cite examples, future employers cannot be certain they have the skills necessary for a position. The process of mindfully reflecting when selecting work requires students to describe why the work they choose is important as well as the skills and knowledge they learned when they created the work sample. Scaffolding this process with prompts and questions for reflection makes the lessons learned during the college and university experience explicit to students so they can communicate the skills they learned and back up their assertions with evidence to future audiences of their ePortfolio.

Determining the Audience of the ePortfolio

In addition to illustrating the steps for guiding reflection processes, the case studies in *ePortfolio as Curriculum* emphasize the importance of teaching students to consider who the audience for their ePortfolio will be. Audience consideration is described as a factor often forgotten during the ePortfolio development process. Including this practice enhances the effectiveness of the ePortfolio product and brings attention to the fact that many of these ePortfolios will be posted to a public website. The use of a public platform adds several considerations that must be attended to for safety and copyright compliance, as well as for effectively crafting a product and narrative for the intended and, potentially, unintended audiences. Many students begin this process unsure of what the outcome will be and how it will be used by others. They need help making the connections between artifacts and their goals for the ePortfolio, as well as their ultimate professional goals (Cordie, Sailors, Barlow, & Kush, 2019). Many of the case studies in this publication model this explicit assistance to students.

The first chapter, titled "ePortfolio as Curriculum: Revisualizing the Composition Process" (Cicchino, Efstathion, & Giarrusso, 2019) discusses the decision-making processes students are continuously engaged in when selecting work for their ePortfolios, while also keeping the audience of the ePortfolio in mind throughout these processes. The authors provided various activities that can be enacted to accomplish these goals. The first activity has students view other ePortfolios and asks them to consider questions about themselves as viewers, such as why they preferred certain ePortfolios. The activity also asks students what they want viewers of their ePortfolios to think of them and what texts and work they should include to accomplish that. These thoughtful discussions allow students to preemptively consider factors that might otherwise be considered later as extraneous variables. However, we know that details like design consistency and navigation around the ePortfolio are essential to be able to access all features of the ePortfolio.

Cicchino et al. (2019) included audience accessibility as a responsibility of the student by considering artifact descriptions and placement. Audience consideration is accomplished through multiple checkpoints during the ePortfolio creation with questions that require students to reflect on how their artifacts are presented, if they should continue this design, and what needs to be changed. Student testimonials show the thoughtfulness students put into their products with the audience in mind. The reflection questions devised by Cicchino et al. (2019) model a successful method for requiring students to explicitly state who may view their ePortfolios during the construction process, rather than considering the audience after the ePortfolio has been completed.

As another example of considering future ePortfolio viewers, Stonaker, Cohn, Carpenter, and Chen (2019) emphasized audience awareness as one of three priorities in their ePortfolio-focused courses to ensure students are constantly thinking about the final ePortfolio product. The goal is to create a curriculum that promotes metacognitive thinking by requiring students to consider the user experience with their ePortfolio. Cohn et al. (2019) accomplished this by offering several opportunities for students to receive feedback from various stakeholders including their peers, relevant faculty, and other advisers selected by students. Discussing their ePortfolios with these different audiences allowed for more critical reflection about how their work was received. Before they incorporated these opportunities for audience previews, Stonaker et al. (2019) found that student reflections were limited and simple as they only would include short observations about the ePortfolio content. Discussing their ePortfolios with these different audiences allowed for more critical reflection of their

work. The authors gave the examples of a writing studies professor prompting students to think about how much text is on a slide, while a discipline-specific adviser could give advice about potential data visualizations. In addition to encouraging positive revisions to an ePortfolio, these opportunities for deeper reflection and metacognitive awareness made students better able to establish a story for their ePortfolio as well as their own identity for the present and future.

These are two exemplar case studies of many in this volume that require the consideration of the audience as an essential step in ePortfolio creation. This focus allows students to develop deeper reflections about their work beyond their own opinions and thoughts. It also considers additional, essential stakeholders (e.g., future employers) who may potentially view their ePortfolios, which allowed them to preemptively market their work to their goals for their future.

Considerations for Managing an ePortfolio Program

Finally, an important area to consider when implementing an ePortfolio curriculum in your course, program, or school is the logistics that come with this endeavor. As with any new program, there will be challenges to overcome such as budgets, onboarding, and staff bandwidth. Each chapter provides advice, reflections, and lessons learned by faculty on their own journey to creating an ePortfolio curriculum.

As one helpful example, Denning (2019) provided practical advice for getting an ePortfolio program off the ground and running. The program began with a faculty-initiated, grant-funded pilot program. Even with Denning securing a grant, administrative support was limited (i.e., just the author), so Denning was cautious about not advertising the program widely. Despite this lack of advertisement, the program grew every year due to students promoting the value of ePortfolios to one another. Students appreciated the thoughtful processes of this ePortfolio program including prompts to engage in thoughtful brainstorming for the ePortfolio, guidance on selecting artifacts, and finally building the ePortfolio using WordPress. The interest in the program required thoughtful planning to mitigate the limited capacity. First, even though there was high student interest to participate, Denning kept the enrollment to 10. If the enrollment was higher, the author understood they could not provide the same, hands-on support that makes the program successful. Denning also reserved seats for freshman and limited how many seniors could enroll in the course in order to use the ePortfolio to focus on future coursework at the institution. Finally, Denning's use of technology enhanced the ability to continue the program with a single-person team. Students used text analysis tools to create a tagging

system with WordPress, which enhanced the navigability for those viewing the ePortfolio.

In another case study, "The Invited ePortfolio Curriculum," Katherine Bridgman showcased an example of a fairly new university (established 2009), also a designated Hispanic-serving institution (HSI), implementing a four-course ePortfolio curriculum. Physically, the university is located in an area without many institutions of higher education. Bridgman (2019) developed the ePortfolio curriculum aware of the importance of connecting students to the physical areas surrounding the university in order to understand their places in their current and future communities. This was imperative for an ePortfolio program at this institution. Students were guided through the process of building the ePortfolio, with the first step being to engage with their world, both within the university as well as outside of it. The second step involved documenting those experiences. As an exemplar assignment to support student engagement with the broader community, students were tasked with interviewing someone in a career related to their major and reflecting after the interview. As with other ePortfolio programs, this assignment encouraged students to reflect on their identities as current and future members of many communities. While Bridgman (2019) provided advice specific to a university's needs, the advice is appropriate for many ePortfolio programs. It is important to consider the specific needs of your own university, the surrounding community, and the students.

After reading this series of case studies, many will likely feel excited and optimistic about implementing an ePortfolio program at their own institution or within their programs. Advice such as not advertising a new program, as Denning (2019) discussed, may seem counterintuitive, but as with any new program it is important to be realistic about starting small then building up from that point. These two case studies, along with many others in the publication, provide some concrete advice for challenges to expect and ways to solve them either preemptively or as they come up.

Areas for Improvement

ePortfolio research encompasses a large and varied range of methodologies, from anecdotal evidence to empirical studies. Earlier, I cited Matthews-DeNatale (2019) study, which includes thematic analyses of interviews with alumni who had used ePortfolios to understand what students had learned in connection with the ePortfolio process. The author provided helpful details and information (pp. 116-121). In this chapter, and others, it would have been interesting to read a thorough methodology, similar to what one can access in peer-reviewed research articles and reports. This additional information would be helpful for

understanding the research and designing future, similar studies as the field of ePortfolio research continues to grow and develop.

The figures, images, and resources accessible through websites and QR codes supplement this publication very well, especially because ePortfolios inherently include many visual features. A minor recommendation, which could still be implemented, would be to include all the supplemental resources from this book in one, organized location (e.g., a website) similar to an ePortfolio. This would be a helpful instrument for readers who may not be as familiar with ePortfolio, in addition to the sample ePortfolios cited throughout.

Conclusion

All authors of this publication graciously offered concrete advice and evidence for effectively engaging in ePortfolio work with students. Topics included specific prompts for faculty just beginning the process of encouraging their course or institution to engage in this work; evidence of exemplary ePortfolios from students; guides for creating an ePortfolio program on your own campus, including analyses of platforms like WordPress; fruitful reflections of program implementations; and syllabi from courses implementing ePortfolios. Importantly, this publication includes research on the efficacy of ePortfolios by reporting student views, as well as content analyses of student products. As Rhodes (2019) mentioned in the book's foreword, this publication is accessible to many hoping to develop an ePortfolio program, including those who have ample experience as well as those just learning about the use and value of ePortfolios in higher education.

References

Bridgman, K. (2019). The invited ePortfolio curriculum. In K. B. Yancey (Ed.), *ePortfolio as curriculum: Models and practices for developing students' ePortfolio literacy* (pp. 191-202). Sterling, VA: Stylus.

Burns, S., & Thompson, J. A. (2019). Collateral learning as an ePortfolio curriculum. In K. B. Yancey (Ed.), *ePortfolio as curriculum: Models and practices for developing students' ePortfolio literacy* (pp. 33-46). Sterling, VA: Stylus.

Cicchino, A., Efstathion, R., Giarrusso, C. (2019). ePortfolio as curriculum. In K. B. Yancey (Ed.), *ePortfolio as curriculum: Models and practices for developing students' ePortfolio literacy* (pp. 13-32). Sterling, VA: Stylus.

Cordie, L., Sailors, J., Barlow, B., & Kush, J. S. (2019). Constructing a professional identity: Connecting college and career through ePortfolios. *International Journal of ePortfolio, 9*(1), 17-27. Retrieved from http://theijep.com/pdf/IJEP319.pdf

Denning, S. (2019). Limiting ePortfolio requirements, raising student energy. In K. B. Yancey (Ed.), *ePortfolio as curriculum: Models and practices for developing students' ePortfolio literacy* (pp. 123-134). Sterling, VA: Stylus.

James, K. S., Scida, E. E., & Firdyiwek, Y. (2019). ePortfolios in a world language learning curriculum. In K. B. Yancey (Ed.), *ePortfolio as curriculum: Models and practices for developing students' ePortfolio literacy* (pp. 47-70). Sterling, VA: Stylus.

Matthews-DeNatale, G. (2019). Untangling the past and present while weaving a future. In K. B. Yancey (Ed.), *ePortfolio as curriculum: Models and practices for developing students' ePortfolio literacy* (pp. 107-122). Sterling, VA: Stylus.

Pinar, W., & Grumet, M. (1976). *Toward a poor curriculum*. Dubuque, IA: Kendall/Hunt.

Rhodes, T. L. (2019). Foreword. In K. B. Yancey (Ed.), *ePortfolio as curriculum: Models and practices for developing students' ePortfolio literacy* (pp. ix-x). Sterling, VA: Stylus.

Stonaker, J., Cohn, J. D., Carpenter, R., & Chen, H. (2019). Metacognition across the curriculum. In K. B. Yancey (Ed.), *ePortfolio as curriculum: Models and practices for developing students' ePortfolio literacy* (pp. 169-190). Sterling, VA: Stylus.

Yancey, K. B. (Ed.). (2019). *ePortfolio as curriculum: Models and practices for developing students' ePortfolio literacy.* Sterling, VA: Stylus.

Yang, D., Ngai, A. C., & Hung, H. K. (2015). Students' perception of using ePortfolios for learning in higher education. In W. Ma, A. Yuen, J. Park, W. Lau, & L. Deng (Eds.), *New media, knowledge practices and multiliteracies* (pp. 225-233). Singapore: Springer Media.

_____

ERIN HORAN is the Assistant Director for Research, Assessment & Pedagogy in the Center for Teaching, Research & Learning at American University. In this role she consults with faculty on all aspects of instruction including assignment design, rubrics, course and program design, Open Educational Resources (OER), and the Scholarship of Teaching and Learning (SoTL). Erin holds a PhD from the University of Georgia in Educational Psychology, Applied Cognition and Development. Prior to joining American University, she was a Postdoctoral Research Analyst in the Office of Quality, Curriculum, and Assessment at the Association of American Colleges and Universities (AAC&U). At AAC&U her research focused on assessment and accreditation in higher education, specifically related to the validity of assessment techniques that utilize authentic student work.