

Thinking Skills by Design: Using a Capstone ePortfolio to Promote Reflection, Critical Thinking, and Curriculum Integration

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A capstone ePortfolio is a digital space where students can gather and integrate their learning experiences from their undergraduate careers into a meaningful whole, demonstrate their growth as learners, and connect their learning to the world. The process of creating a capstone ePortfolio equips students with the digital composition skills necessary for creating a professional career ePortfolio, helping them to showcase their strengths for future employment and for graduate or professional school applications. This project piloted an undergraduate capstone ePortfolio program designed to be the culminating experience for juniors upon completion of the general education program (i.e., core curriculum). Pilot program results, based on a group of 18 students from a variety of academic and demographic backgrounds, suggest that the capstone ePortfolio program can serve as a vehicle for promoting reflection, critical thinking, digital literacy and composition, and integration of curricular experiences. This article presents the results of a mixed-method assessment of the pilot and discusses how these results will be used to frame the semester-long capstone ePortfolio program for the undergraduate general education program at a large AAU research institution.

This article describes pilot work for a capstone course, requiring a culminating ePortfolio, within the undergraduate general education curriculum (i.e., core curriculum) of a large AAU research institution in the northeast United States. Although many examples of the use of ePortfolios as educationally purposeful culminating learning experiences in academic majors can be found (Cambridge, 2010; National Survey of Student Engagement, 2011), the capstone course and ePortfolio described here are required for all undergraduate students in their junior year as part of the newly launched general education program (GEP), including transfer students with significant credits of general education completed elsewhere. Due to the scale of implementation and the significant impact this new course will have on requirements for degree completion, a pilot was conducted to assess practical aspects of course delivery, as well as the ability of the course content to help students achieve the desired learning outcomes of the course and of the general education program.

The new GEP, launching in fall 2016 with new and re-designed course offerings, is based on the curricular components of American Association of Colleges & University's (AAC&U) Liberal Education and America's Promise (LEAP) initiative, developed to prepare students in broad thinking and communication skills and emphasizing integrative learning (AAC&U, 2011).

It also may be the first of its kind to incorporate several high-impact educational practices as a purposeful, integrated package to improve student persistence (Carini, Kuh, & Klein, 2006; Kuh, 2008; Kuh, Cruce, Shoup, Kinzie, & Gonyea, 2008; NSSE, 2007; Pascarella & Terenzini, 2005).

This revised GEP is designed to help students learn transferable higher-order thinking skills that will serve

them well in educational and career endeavors. It includes: critical thinking, integrative learning, quantitative reasoning, scientific reasoning, ethical reasoning, communication skills, and digital citizenship.

The learning outcomes of the program include the following: Through completion of the general education curriculum, students will

1. attain and apply knowledge in written, oral, and visual communication; mathematics and quantitative reasoning; and natural sciences;
2. acquire, apply, analyze, evaluate, and integrate knowledge from a wide range of disciplines;
3. attain and apply critical thinking skills to define and solve problems;
4. demonstrate an understanding of human and cultural diversity within local and global contexts;
5. acquire the skills, technologies, knowledge, ethical judgment, and personal responsibility for effective citizenship, professional leadership, and lifelong learning.

The goal of the general education capstone and the required ePortfolio is to provide a mechanism through which students can critically review content from disparate general education classes and make connections across them, integrating their work to make broader knowledge connections that can be more easily leveraged and applied in new learning situations (Hauhart & Grahe, 2014; Kinzie, 2013; Mentkowsky & Sharkey, 2011). Specifically, reflection within the ePortfolio allows students to consider how they have been successful in their learning and how learning in the present situation relates to other contexts (Buyarski et al., 2015). From this reflection, they gain practice in

metacognitive thinking, which they can use to help them self-regulate learning processes in future learning situations (Flavell, 1979; Livingston, 2003). The process of reflecting on learning in general education and integrating content from across general education courses increases the likelihood that students will transfer knowledge and skills gained to study in the major and to life outside the classroom (Mentkowski & Sharkey, 2011). Further, it raises the level of importance of the GEP by not allowing it to be something that students can just forget about as they check off courses, but as an experience on which to reflect (Mummalaneni, 2014). This cultivates the realization that it has inherent value for them in later studies and in their lives after college (Eccles & Wigfield, 2002; Kinzie, 2013; Kruger, Holtzman, & Dagavarian, 2013; Wigfield & Eccles, 2000).

The Capstone ePortfolio Pilot as a Learning Experience

A pilot was needed to ensure that the students in this newly revised GEP view the culminating ePortfolio and the capstone course itself as a meaningful part of their educational experience, where students could apply “higher-order thinking, authentic learning, and multilayered decision-making while engaged in an experiential learning activity” (Buzzetto-More, 2013, p. 1), and bring a “holistic understanding to students’ educational journeys” (Kinzie, 2013, para. 2). A six-week mini-capstone was proposed. In alignment with the generally recognized purposes of capstones (Kinzie, 2013) and the use of reflective ePortfolios (Cambridge, Cambridge, & Yancey, 2009; Eynon & Gambino, 2016), the design of the pilot was meant to simulate the conditions of a real capstone course and to assess the ability of the online course design, as represented in the capstone syllabus (Appendix A): (1) to engage students in the capstone experience and promote their perceptions of this experience as meaningful to their educations; (2) to promote the achievement of the identified capstone learning outcomes (see Table 1); and (3) to be feasibly implemented across large numbers of students from disparate disciplines, including students transferring in general education coursework from other institutions.

In the pilot, students were required to complete three tasks:

1. upload examples of prior course work to demonstrate the achievement of learning outcomes of each component of the general education curriculum into their ePortfolios;
2. complete one essay in which they reflected on the connections and meaningful integrations of their general education coursework and their

intended field of study, outlining their understanding of general education course topics and how these topics contributed to a deeper understanding of their intended major; and

3. summarize the larger impact of the general education curriculum on their intellectual development during their time at the university delivered via the ePortfolio tool.

This pilot project was designed to determine the extent to which the Capstone ePortfolio experience, in practice, will promote student reflection, critical thinking, and curriculum integration and provide a meaningful learning experience for all undergraduate students, all of which are found in the literature of both ePortfolios and capstones to be productive outcomes of such an educational experience (e.g., Eynon & Gambino, 2016; Gardner & Van Der Veer, 1998; McGill, 2012; National Survey of Student Engagement, 2007). In addition, the capstone provided an opportunity for assessment of the GEP (Berheide, 2007). Artifacts for reflection and inclusion in the ePortfolio were chosen by students, in consultations with instructors. Not all artifacts were required to address every component of the general education curriculum, though all artifacts should address some component of the general education curriculum.

Method

Institutional Context and Participants

This pilot program was conducted in a large public Research I institution in the Northeastern United States. The institution will transition to the new GEP, described above, in the fall of 2016 with the pilot capstone program conducted in the spring semester prior to the program launch. The shortened capstone ran for six weeks during the midpoint of the semester as a hybrid course (*hybrid* to provide additional feedback opportunities in the development stage), with face-to-face opportunities for student engagement, peer support groups, and feedback loops. (The actual capstone will be conducted solely online as proposed in the GEP and to meet capacity needs.) Students participated in the program voluntarily through a proprietary product, the platform being both the course and the vehicle by which they created and hosted their ePortfolios. Although the pilot students had not participated in the new GEP, the pilot was adapted to allow for their own GEP to be incorporated into the new framework.

The study personnel included two doctoral-level teaching assistants and two administration assessment staff. Capstone instruction and course management responsibilities were handled by the teaching assistants, while the administrative assessment staff was

Table 1
Capstone Learning Outcomes

No.	Outcomes
CLO 1	Adapt and apply skills, abilities, theories or methodologies acquired in one situation to new situations
CLO 2	Connect relevant experiences and academic knowledge
CLO 3	Demonstrate an evolving sense of self as learner
CLO 4	Integrate different forms of communication to enhance meaning (prose, sound, visual media)
CLO 5	Formulate a concept of digital citizenship and be able to fashion an online identity that demonstrates an awareness of the public/private divide

responsible for developing and executing the assessment plan. However, the whole team worked together, meeting regularly on the pilot project. In addition, there were general education administrative stakeholders funding and supporting the project.

The participating students were recruited from a variety of undergraduate education programs, including Ronald McNair and Student Support Services Federal TRiO Programs, the Honors College, and programs targeted to support underrepresented and low income students, as well as via the transfer student listserv. Participants were incentivized in several ways. First, they received expert guidance to help them develop their integrative and reflective ePortfolios, which has value in their career and academic development. Second, they were given an opportunity to present at a prestigious campus event, the Celebration of Academic Excellence, which they could include on their resume or curriculum vitae as having been an active participant. Finally, completion of the pilot and all ePortfolio components would result in one credit of successful independent study being added to their transcripts and a deposit of \$100 into their Campus Cash accounts.

The “course” had an initial pool of 35 student volunteers, with 25 of them committing to participation. Eighteen students completed the capstone and all requirements and also provided consent to participate in the research component of the pilot project. The primary reason offered for not completing the capstone was “too many other demands on my time.” In the exit survey, one respondent selected “the technology was too confusing.” Over two-thirds of the participants (68%) expressed a willingness to volunteer for a full semester pilot in the fall.

The final sample of 18 students included students from many different backgrounds and majors. With regard to gender and race/ethnicity, the sample was 72% female and 50% White and 50% Black. Five of the participants were international students. Academically, the students were diverse, as well. For those who gave permission to participate in the study, one was a special admittance student, one was a transfer student, and the remaining 16 were admitted as freshmen. Four students had junior standing and 14 senior standing at the time

of the pilot, having completed the majority of their undergraduate general education curriculum. With the exception of one, these students were high achieving: all participants had cumulative grade point averages (GPAs) over 3.0, with nine (50%) having cumulative GPAs over 3.75. Among the majors represented were single and double majors, including: accounting ($n = 1$), psychology ($n = 3$), social sciences interdisciplinary degree program ($n = 3$), political science ($n = 1$), biochemistry ($n = 1$), biological sciences ($n = 3$), biomedical science ($n = 2$), chemistry ($n = 1$), geological sciences ($n = 1$), biomedical engineering ($n = 1$), and civil engineering ($n = 1$). This diversity allowed for a wide range of curricular foci to be represented in the capstone ePortfolios.

Access to digital technologies ranged across the spectrum, with 64% indicating that they had some access to digital technologies, 27% indicated they had nearly unlimited digital access, and only two students indicating limited access with computer and internet access available only on campus or at public libraries. Most of the students in the pilot (86%), had never taken a class utilizing the ePortfolio platform. Their prior experiences building ePortfolios varied, with the majority (73%) having little to no experience, 18% with limited experience but considering themselves beginners, and only two feeling comfortable with ePortfolio platforms.

Students utilized the Digication ePortfolio software, an online product, to produce their ePortfolios. They were provided a general template to follow but were allowed to deviate from that template (which included a learning philosophy and outline of GEP components as a guide) so that their ePortfolios reflected their own uniqueness, creativity, and variety of artifacts. ePortfolios consisted of text and multimedia, including pictures, video, and music, as well as PowerPoints and PDFs of assignments from a variety of disciplines. In addition, students included curricular and co-curricular experiences. Students were directed to create a curricular ePortfolio, emphasizing learning and development, as well as curriculum integration, compared to a professional ePortfolio, which is styled more on a resume format and aimed at employment goals. The Digication platform allows

Table 2
Approaches to Learning Questionnaire

Scale	α	Pre-test		Post-test		ES
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Self-regulated strategy use	0.60	4.17	0.42	4.16	0.65	0.02
Intrinsic learning motivation	0.56	4.28	0.54	4.33	0.58	0.14
Critical thinking	0.86	3.88	0.89	3.66	0.84	0.18
Integrative learning	0.72	4.19	0.50	4.27	0.51	0.18

multiple ePortfolios to be created, and students may adapt their capstone ePortfolio into a professional ePortfolio for future uses. This was not explored in the capstone.

Study Design and Data Collection

This study employed mixed methodology for both the development of the pilot and the research approach. Mixed methods allowed the assessment team to triangulate results. Data were collected in the following ways: (a) pre-post survey, (b) Approaches to Learning Questionnaire, (c) qualitative analysis of student portfolios, (d) assessments of student assignments using rubrics, and (e) student feedback via forums.

Instructor-created pre-post survey. The instructor-created pre-post survey contained a combination of open- and close-ended questions and was administered via Google Forms. The pre-survey had ten questions, and the post-survey had 22 questions. This survey was designed to assess students' understanding of digital literacy, technical skills in digital composition, and the purpose of a reflective capstone ePortfolio as compared to a professional presentation ePortfolio. In addition, in the post- version, students were asked to identify aspects of the course that were most and least helpful to them in completing the weekly assignments and the culminating ePortfolio.

Approaches to Learning Questionnaire. The 22-item online Approaches to Learning Questionnaire, developed by Van Zile-Tamsen and Livingston (1999) to assess students' perceptions of growth in higher-order thinking skills as they progressed through the GEP, asked students to rate the extent to which statements describe themselves as learners on a five-point scale, from strongly disagree to strongly agree. This questionnaire contains subscales relating to Self-Regulated Strategy Use, Intrinsic Learning Motivation, Integrative Learning, and Critical Thinking. Students responded to the questionnaire twice, during both the first and last week of the pilot. This measure is still being piloted but has good concordance with agreed-upon definitions of self-regulated strategy use (Van Zile-Tamsen & Livingston, 1999), intrinsic motivation for learning (Eccles & Wigfield, 2002), integrative

learning, and critical thinking (American Association of Colleges & Universities, 2011). Cronbach's alpha internal consistency reliability estimates and descriptive statistics for the pre- and post- administrations are shown in Table 2. Evidence for the reliability of the scales indicates that Integrative Learning and Critical Thinking are much more reliable than Self-Regulated Strategy use and Integrative Learning. However, all results for this instrument should be considered primarily exploratory at this time.

Qualitative analysis of student portfolios. A qualitative thematic analysis of student portfolio content examined student use of ePortfolios to reflect, think critically, and integrate their curriculum experiences.

Assessments of student assignments using rubrics. As part of the instructional process, student assignments were assessed with rubrics developed by the instructors. (Students provided feedback on usefulness of rubrics). Student essays and artifacts were submitted to student ePortfolios by students through the ePortfolio platform. The platform was used for both peer and self "grading," as well as reflection on artifacts. See sample rubric adapted from the AAC&U Value Rubrics in Appendix B. Rubrics were used to assess artifacts individually and the ePortfolio holistically on learning outcomes and related to GEP components.

Student feedback via forums. The instructor led three face-to-face and online forums to collect students' feedback. The instructors also maintained a detailed record of interactions with students that occurred during office hours and electronically.

Data Analysis

Approaches to Learning Questionnaire. Changes in pre- and post-scores were examined to determine if students changed in their perceptions of their approaches to learning after completing the capstone requirements. Since the sample size was so small (12 students who completed both pre- and post-questionnaire), effect sizes were used to determine the magnitude and direction of changes rather than traditional paired samples *t* tests.

Qualitative analysis of student portfolios.

Student ePortfolios were qualitatively analyzed for reflection, critical thinking, and integration of the academic curriculum. Standards of qualitative analysis, including thematic coding, were utilized. Each ePortfolio was analyzed individually and then the full set was re-analyzed as a whole with the set of codes for appropriate fit. Qualitative analysis was informally triangulated with instructors' understanding of rubric assessment outcomes in areas of reflection and integration of curriculum.

Results

Instructor Pre-Post Survey, Student Forums, and Office Hours Feedback

Feedback was collected by the instructor through surveys, in-person and online student forums, and office hour discussions. The following is a summary of the surveys and those notes. Throughout the pilot course, students expressed appreciation for a moment to look back over their coursework, surprised by all they had done and by the contrasts between who they were as freshmen and the students they had become. Intellectual growth was witnessed when students realized that their positions on controversial social and political issues had changed. In regards to introspection about their growth over their curriculum, one student stated, "I read my first research paper again and I couldn't believe those were my words. I totally disagreed with everything I wrote as a freshman!" Reflection could be found in other statements, as well. One student, for example, noted: "I haven't looked back at the things I have done throughout my time here . . . in a comprehensive and thoughtful way like this before." Another student stated, "The sky's the limit on all the things that make you unique." With regard to curriculum integration one student noted,

Reflecting back on my work made me realize how a lot of it actually impacted me as a student, even though I did not think it did at the time. I would not be as well-rounded, open minded, or understanding as I am today if it were not for my general education courses.

Another student said, "It made my gen ed courses actually mean something."

Unexpectedly, the instructors were impressed by the variety and depth of the stories, and narratives the students shared, providing insight into their lived experiences. The students reflected on and shared moments of discovery. Also, through peer groups and the pilot program, students developed a sense of community (as evidenced by their desire for a group

picture at the Celebration of Excellence). Group cohesion was surprising, as this was an online cohort for a short six-week program.

From the pre-post instructor survey overall, the students' understanding of digital literacy did not change from the beginning to the end of the pilot. When asked to define "digital literacy" on the opening survey, most students responded with "the ability to use technology" or "to find information" on the Internet. Only one student defined digital literacy as "maintaining some kind of profile or presence" on the Internet. When asked, "How has your understanding of digital literacy changed since completing the mini-course," many responded "not a lot" or "I'm still not sure what digital literacy means." Of the few students who noted a change in understanding, one wrote, "Being able to use such a tool is no longer sufficient enough. Being able to maneuver such tool to present one's own thoughts and experiences as clearly as possible is my new understanding of 'digital literacy.'" The opening/exit surveys showed a greater understanding of how an integrative capstone ePortfolio differs from a professional career ePortfolio. The surveys, moreover, showed an improvement in technical skills using a digital media platform and a strong likelihood to use these new skills on digital media projects in the future.

Furthermore, the survey indicated the order students made greatest use of the following help resources: (1) ePortfolio startup guide (86%), (2) e-mails to instructor (64%), (3) peer support (50%), (4) visual guide to ePortfolios (36%), (5) other online help (e.g., ePortfolio platform videos; 21%), (6) e-mails to support technology support (14%), (7) scheduled office visits (7%), and (8) open lab walk-in hours (0%). Utilizing these resources and participating in the project helped the students develop their abilities. Of the 14 students who responded to the survey, a majority indicated improvement in using a digital media platform (mean 3.36/4.0) and an increased likelihood of using their technical skills in other digital media projects in the future (mean 3.64/4.0).

One resource students did use was the rubrics. Students made good use of the evaluation rubrics for self-reflection in developing their ePortfolios, with most students having consulted the rubrics for two or more assignments prior to submission, $M = 2.93$, $n = 14$. Also, on a scale of 1-5, a majority of students (57%) ranked clarity of the rubrics at a 4 ($5 = \textit{clearly articulated learning outcomes}$). The mean was 3.57 ($n = 14$).

Finally, the exit survey showed great satisfaction with the ways in which the pilot course fulfilled student expectations, with 43% responding 5/5 (*fully satisfied expectations*) and 36% at 4/5 (*nearly fulfilled*), $M = 4.21$, $n = 14$. While one student expressed surprise at the amount of work involved in the pilot, open responses to

“unexpected outcomes” were overwhelmingly positive. Many students noted surprise at realizing how much work they had actually done as an undergraduate, how many connections they were able to draw, how much their general education curriculum had actually impacted them as a student; they even realized the existence of “missed opportunities” after looking back over their experiences.

Approaches to Learning Questionnaire

As shown in Table 3, students’ scores on the self-regulated strategy use scale remained quite similar from pre- to post-questionnaire, increasing a negligible amount ($d = -0.02$). In each instance, students rated themselves on the high end of the scale in terms of monitoring and regulating their own learning. With regard to integrative learning, students’ scores remained on the high end of the scale for both questionnaire administrations, but in terms of effect size, there was a small increase from pre to post ($d = 0.18$). In contrast, students’ critical thinking scores and intrinsic motivation for learning scores decreased a small amount from pre- to post-questionnaire ($d = 0.18$ and 0.14 , respectively). Interestingly, they rated themselves initially lower in critical thinking at the beginning, and they were even less confident in their Critical Thinking skills at the end of the pilot. In terms of initial ratings, intrinsic motivation for learning was highest at the beginning and also decreased. These findings are not surprising in light of the qualitative analysis of their portfolios.

Qualitative Analysis of Student Portfolios

In general, the reflective essays took the form of personal autobiographical narratives that were far more reflective than integrative. Even when present, critical reflection tended toward autobiographical narrative, with an inward focus upon self instead of greater, global issues—again, with a few notable exceptions. With regard to critical thinking, students made judgments, evaluations, and analyses of their own experiences, artifacts, and education as presented in their ePortfolios. The majority of critical thinking was represented through the individual artifacts, mainly submitted as unique assignments, and not represented in the personal learning statement or reflective essay. However, the level of both reflection and integration of curriculum represented in the ePortfolios varied among the students. More specifically, several themes emerged from convergent theme analysis. These included attributes, emotion, values, narratives, reflections, and integration of curriculum.

Attributes included students’ use of their ePortfolios to share their identities in regards to their demographics and academic data as direct points. For some students, this information was stated in language similar to other

online profile introductions; for example, “I’m an international student from Ho Chi Minh, Vietnam (the name ‘Saigon’ might ring a bell). I enjoy traveling, cooking Vietnamese cuisine, making crafts, and catching up on current politics, human right[s] issues, and East Asia/Southeast Asia’s news.” For others, the description became more narrativized; for example,

As a single mother of two teenage boys and a full-time student, I am in a unique class of adult learners . . . and I take great pride in both roles. As one can imagine, combining these two demanding roles consumes the majority of my time, and leads to many late nights and little sleep, but I wouldn’t give it up for anything! My children are my world, but coming back to school has given me something that I can be proud of outside of being someone’s mother.

Others presented their identities in resume format, which blended the genre conventions of presentation and reflective portfolios. In addition, these were often accompanied with pictures containing descriptions. Their identity attributes were evident not only in their introductory page but throughout their learning philosophy and reflective essays when they reflected on their experiences while identifying who they were: “In my sophomore year I became a Teaching Assistant for this course. I recognized the need for a TA among my classmates and was eager to volunteer as a TA.”

Second was the use of ePortfolios to express emotion and values. Students would share their viewpoints, standpoints, beliefs, and attitudes and portray their emotions and values through their discussions and choice of visual media. For example, many students chose visual images of experiences that held great passion for them in extracurricular realms of their education, such as study abroad experiences, connecting with others, family, and friends, and pictures that represented their cultural and ethnic heritage. In one picture from a trip abroad, a student described the individual she was hugging and wrote, “I’ve visited the Dominican Republic three times during spring breaks to teach English. While there, I discovered a passion for teaching that I brought back to [university] with me!” Furthermore, when discussing their values related to learning they used words related to passion and strong desire to engage in learning. In another example, one student stated,

I wanted my college experience to be more than this, so I pushed myself . . . and spend more time early on learning the material . . . In order to truly learn I understand that not only will it take time, but it will also take a lot of motivation. I would say I motivate myself to learn . . . Learning enables me to broaden my perspectives and become a better educated, more

well-rounded person; even if I am not particularly interested in the material, I recognize that there is still value in gaining knowledge.

Another stated, “Learning has been a strength and passion of mine that has kept me going through the years.”

Students also used their ePortfolios as a reflective tool. Although specifically prompted, they presented well-developed reflective essays and descriptions of artifacts that shared stories with a sense of connection to something deeper or broader than the surface artifact or statement being displayed. One student included an artifact that was her internship reflection journal. Most students demonstrated strong reflection skills. Only three of the 18 students had reflection skills that were lacking or basic as demonstrated by the portfolio as a whole. One student reflected,

I chose none of the samples for the mere fact that I did extremely well or utterly terrible on them or in the course; they were chosen to depict growth and portray that there is always room for improvement as one continues to pursue the undergraduate career and even beyond that.

Many reflective statements demonstrated that students were truly able to make connections beyond surface observation. For example,

I think this essay is vital to include because it explains my thoughts and concerns prior to my service. I knew that my service would be a learning experience for me, but I was unsure what I would be taking away from it.

Moreover, these reflective statements also showed students developing more nuanced approaches to their learning situations as can be seen in the following response: “Since the course, I have grown to learn that it is okay to have different opinions than others; one person’s opinion is not necessarily greater than another’s.” Students also further established developments in their understanding of the complexity of meaning: “Ever since writing this paper I have been able to dig deeper when researching and analyzing other topics. I have learned to look beyond the surface in order to truly find the meaning behind certain things.”

Lastly, integration of curriculum was a theme expressed in the discussion of academic experiences beyond single experiences or courses. Some students spoke to how their curriculum actually focused in the integration:

Interestingly, my course choices foreshadowed the path I would eventually end up taking. Courses such as developmental psychology and parenting displayed my inner desire to learn how the mind

works and use that knowledge to help people better their lives! . . . I also had a heavy scientific course load including anatomy, chemistry, and nutrition. I have always found the biological sciences attractive. I am unendingly intrigued by the inner workings of the human body and continue, to this day, to seek out opportunities to learn more about how the body works!

Others spoke more broadly to the integration of the curriculum connecting it to their personal and career lives:

Through my general education requirements . . . I was able to explore these empathy-driven interests. I explored cross-cultural understandings, economically disadvantaged communities, race in America, and the legal system as it relates to morality. In each of these courses, I felt the fibers, the empathy which motivates me, resonate. As I explored the variety of stories so often forgotten or overlooked by others, my curiosity in the human experience only expanded, and it still expands with my majors.

Another student furthers this sentiment, stating that

By my senior year I really began to appreciate all the opportunities that I have had to learn. Three years ago, I thought my World Civilizations class was futile to me as an Accounting major. As I reflect back . . . I realize that the class did [affect] me, not necessarily the specific learning material, but with the exposure I have gained by taking the course. I feel like I understand people better and their cultures. I understand others viewpoints and the things that are meaningful to them. Specifically, this impacts my role as a global citizen because it is important to have awareness of what is going on in the world.

Student Artifacts Assessed by Rubrics

Rubrics, based on the LEAP rubrics, were utilized to assess student work. Several themes emerged from the use of these rubrics.

“Connections” took the shape of unfolding student self-discovery, with personal narratives of how students discovered their major and style of learning, and recognized their personal growth as a student. It was difficult to identify specific evidence of connections between “examples, facts, or theories from more than one field of study or perspective.” Because of the autobiographical nature of the reflections, the unifying or “connecting” factor was the individual student, usually limited to one field of study.

Evidence of ability to “adapt and apply skills” most often appeared in community service, experiential learning, or alternate break experiences, where students used their language, math, and science skills to help others, contribute to an internship assignment, or participate in cultural exchange programs. Students who had not participated in activities beyond the classroom showed difficulty in fulfilling this portion of the capstone. In applying this portion of the rubric, it was difficult to distinguish between a level 3 and 4, as a judgment had to be made whether a student was solving a *difficult* problem (vs. a problem), a *complex* issue (vs. an issue), and whether or not they had done so in an original way. In many cases, the students narrated problems of a personal nature, such as locating student help services on campus or pursuing a social science degree instead of entering the medical field. There was also evidence of ability to adapt and apply skills within students’ academic coursework samples, but these were applications to individual problems without evidence of transfer to new situations.

How students “connect relevant experiences and academic knowledge” revealed, through the rubrics, an amount of overlap between this category and “Articulate Connections” above, especially since both categories emphasize connections between multiple fields of study. The added element of this category seems to be an emphasis on experiences outside the classroom. If anything, this category more effectively addressed the sort of reflections in the pilot.

Demonstrating their “sense of self as an evolving learner” category was the easiest to validate, since both the learning philosophy statement and reflective essay offered an opportunity for students to address their ongoing progress as learners and to project plans for themselves into the future. This category was especially well suited to the mode of personal reflection the students adopted in their essays.

In the rubric theme “integrate different forms of communication,” there was much room for improvement, especially at the point of integrating different forms of communication. While every student at least attempted to create a multi-media design, few actually “integrated” their visual and textual material. Videos were rare and presented with little to no commentary to “enhance meaning, making clear the interdependence of language and meaning, thought, and expression.” Future iterations of the project may need to place greater emphasis on citation of sources for images as well as verifying that embedded media actually “works” (example: certain add-ons work for Mac but not for PC).

Finally, there were the criteria for “digital citizenship.” While the instructors were confident in the students’ ability to present themselves in a responsible manner, it was difficult to find evidence of deeper

critical thought regarding global-digital citizenship since there was no single place for students to articulate explicitly their understanding of digital citizenship in the ePortfolio assignment.

At this time, the rubric categories are not strongly supported by actual evidence in the ePortfolios. As a courtesy to our volunteer pilot students, the instructors merged certain aspects (such as digital citizenship and collapsing the two connections categories into one) when evaluating their work, pending further revisions to the program (see below). The current capstone ePortfolios yielded meaningful results to the students, but fell short when held against the rubric standards, as currently worded. For many categories, it was difficult to determine what distinguished a 2 from a 3 or a 3 from a 4. For example, what evidence would we look for to determine whether a student uses or adapts skills to new situations, or to illuminate concepts vs. deepen understanding?

Overall, the students had a more positive experience using the evaluation rubrics for self-evaluation than did the instructors. While the rubrics apparently articulated the learning outcomes in a way that is helpful to the students, the instructors found it difficult to align the rubrics with tangible evidence from the ePortfolios. That being said, the student self-evaluations of the final ePortfolios were well in keeping with instructor evaluations. Few students scored themselves either significantly higher or lower than marks given by instructors.

Discussion

The capstone course was designed to foster critical thinking skills through a variety of tasks and processes within the capstone project. For example, students had the opportunity to maximize the use of hierarchy for sections, pages, and modules, which promoted conceptual understanding. For students who opted to present their written content in PowerPoint format (which helps to fulfill the multi-media requirement), the slides needed to be accompanied by either a written or oral script that meets the general requirement for the scope of the composition assignment (translated as minimum word count). Depth and development of thought was lacking in all PowerPoint format presentations. In addition, students own ratings of their critical thinking skills decreased a small amount after completion of the pilot.

Reflection was promoted throughout the project through several integral assignments, such as the philosophy statement and the reflective essay. Choosing which artifacts to include over the course of their curriculum required critical reflective observation on the part of the students. Better instruction for students is needed on the rhetorical moves necessary for

incorporating and developing examples in a thoughtful, reflective manner rather than simply naming a title of a course or mentioning hastily a relevant experience in their essays. The current reflective essays and learning philosophy statements tend to offer broad generalizations, with little support or development. Individualization is important in reflection. It was learned in the pilot that we must guide students through the process of individualizing the general template into their own design, reflective of their interests and philosophy of learning. An opportunity for increasing critical reflection might be in the philosophy statement; for example, recasting the current learning philosophy statement to address the meaning of digital literacy, digital citizenship, and the ethical challenges and obligations of lifelong learning in a digital world. The style of writing for this essay should be critical reflection rather than personal autobiographical narrative, apart from specific experiences related to ethical challenges of digital citizenship.

With regard to integration of the curriculum, the students did a thorough job of transferring their undergraduate experiences into quality ePortfolios and demonstrating concrete learning in the realm of the general education curriculum. Along these lines, reflective ePortfolios lend themselves to such curricular developments in that they are open to metaphorical conceptualization, which allows students to build connections and engage in high-order processes of representation. Rather than optional supplementary material, “beyond the classroom” experiences should be required as an integral component of the capstone ePortfolio. Coursework samples and experiences beyond the classroom can be accompanied by a brief written introduction from the student that frames the significance of the project, assignment, or experience. Even a simple criteria statement (why this sample was chosen) would be helpful to evaluators, as well as an important preliminary step towards the final reflective essays. Brief (i.e., 50 to 100 word), required explanations of each artifact promote synthesis and cohesion of the artifacts. One challenge with integration of curriculum in this pilot was found in the assessment through the rubric. In teaching the full capstone, stating more clearly the parameters the reflective essay, which should draw connections across academic disciplines and connect relevant experience with academic knowledge, will be highly important. The essays should demonstrate application of skills to solving complex problems, if the current rubric is to be an accurate reflection of outcomes. More explicit writing instruction will need to be developed for each assignment, detailing style, tone, and rhetorical conventions that will clearly locate students’ ability to synthesize material. We currently cannot validate, for example, areas in which students have made

connections or applied skills. General education outcomes would need to be made explicit in the evaluation rubric, in terms of what sorts of connections the students are to formulate, and whether they are drawing upon academic coursework or experiences beyond the classroom. For example, students’ ability to think critically about global issues, even if clearly articulated in their writing, may or may not mean they have achieved the stated learning outcomes of drawing connections or adapting skills to explore complex problems.

Digital literacy was another important element of the capstone ePortfolio. Building on their communication skills in this digital platform made it easier for students to envision their readers. The ePortfolio platform in and of itself allowed students to engage in digital citizenship. Students became part of a digital community, which prompted instructors to discuss community membership and managing access to content. Visual rhetoric was crucial to the aspect of digital literacy in the capstone. Here, the ability to establish a guiding idea that unifies the ePortfolio visually and conceptually will be an important concept to develop further. Moving forward, there is a need for direct engagement with topics of digital literacy, digital citizenship, and ethical challenges in a digital environment. What was thought would be an implicit outcome will need to be made explicit in learning modules or modifications to ePortfolio assignments.

Recommendations and Future Directions

Overall, the pilot was a success in generating feedback on how the capstone might provide the institution with an understanding of how students can present knowledge, skills, and abilities. The capstone pilot provided evidence about how well the syllabus was developed to guide the instructors in facilitating the course, in addition to the logistics of administering the capstone as an online course.

First, not all students have high autonomous access to information communications technology (Robinson, 2009). Students’ ability to present higher order thinking skills through a technology such as an ePortfolio requires a technology skill-base. The instructors built in peer support groups and instruction, which should be maintained, but 1:1 instruction and the platform learning curve were time consuming and, early on in the pilot, were found to detract from the main learning outcomes of the course. In the actual implementation, these problems may be mitigated by the fact that students will be exposed to the platform as early as freshman year (with the exception of transfer students). However, support documentation will need to be more robust and may include video tutorials and alternative active learning modes.

Second, the rubrics will need to be adapted to be more responsive to assessing critical thinking, reflection, and integration of curriculum. The instructors struggled with using the rubrics, as currently written, to assess these outcomes. Further refinement will be needed, as well as calibration with additional instructors and teaching assistants.

Third, additional assignments will be included in the full semester capstone, further complicating the syllabus, measures of student learning, and assessments. A full semester and the chance to provide multiple opportunities for students to present their work in ePortfolios will likely increase their abilities to demonstrate higher order thinking skills. However, while there will be more time to execute the activities of the ePortfolio, caution will be needed for the instructors and students to have the required support to utilize the ePortfolio tool to represent these outcomes to a greater degree and complexity.

Conclusion

Although there is room for improvement in the execution of the curriculum design, both instructors and students found the capstone ePortfolio experience to be fulfilling in meeting the goals intended of the pilot. Multi-method assessment shows that a capstone ePortfolio course experience can be valuable in giving students a chance to integrate their general education curriculum and demonstrate their higher-order thinking skills in a digital space. Capstone ePortfolio experiences offer excellent opportunities for students to reflect on their undergraduate careers as well as for institutions to assess the knowledge and skills that students have gained throughout the curriculum. A well-developed capstone curriculum design and rubrics help guide these opportunities.

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CATHLEEN MORREALE completed her PhD in Higher Education Administration through the Department of Educational Leadership at the University at Buffalo (UB) in 2011. Her various professional and personal experiences in higher education have focused on assessment, course evaluation, curriculum and program development, experiential learning (including internships and service-learning), counseling and advising, and career development. Cathleen currently serves as a curriculum and evaluation specialist at UB's Center for Educational Innovation.

CAROL VAN ZILE-TAMSEN is currently the Associate Director, Curriculum and Assessment, UB

Curriculum in the Office of Undergraduate Education at the University at Buffalo, and serves as an adjunct associate professor in the Counseling, School and Educational Psychology department in UB's Graduate School of Education. Van Zile-Tamsen's primary focus involves Student Learning Assessment and Program Evaluation, and she teaches courses related to educational testing, psychometrics, and statistics. She has been actively leading assessment work at UB since 2012 in her previous roles as Associate Director for University Accreditation and Assessment and Associate Director for the Center for Educational Innovation. She was the co-chair of the UB Middle States Decennial Review Steering Committee from 2012-2014; UB was fully reaccredited in 2014. In addition to her work at UB, Van Zile-Tamsen helped develop the SUNY Council on Assessment's Student Learning Assessment certificate program and continues to teach the final course in the series.

CHERYL A. EMERSON has assisted in the development of SUNY Buffalo's ePortfolio program since its pilot phase in Fall 2014, beginning with the integration of ePortfolios into the English composition classroom. She has served on the faculty senate Capstone committee, assisted with ePortfolio technical training and faculty development workshops both at UB and at various digital education conferences, and currently serves as the lead TA for the Capstone component of the new UB Curriculum. In 2015, Cheryl received the graduate student essay award from the New York College English Association for her essay "Piloting ePortfolios: Repetition, Difference, and Student Self-Formation." She is currently a doctoral student in Comparative Literature at UB with interests in Continental philosophy, aesthetics, and narrative theory. Her research seeks literary applications of Merleau-Ponty's phenomenology as encountered in his course notes and writings on literary language.

MATTHEW HERZOG currently a PhD candidate in the department of Comparative Literature at SUNY Buffalo. His teaching and research interests span: composition, writing studies, 19th and 20th century British and Irish writing, modernism, digital humanities, cultural materialism, ePortfolio and blogging pedagogies, and writing and first-generation college students.

Appendix A
Syllabus and Assignment Outlines



University at Buffalo
The State University of New York
UB Pilot Capstone Spring 2016

Instructor: Cheryl Emerson, cherylem@buffalo.edu

Office location and hours:

Walk-in lab hours: Thursdays, 1:00-3:00pm, 212 Capen, CEI (Center for Educational Innovation, 2nd floor of Silverman Library)

Online and additional office consults available by appointment

COURSE INFORMATION

Dates/Times: February 29 – April 4, 2016

Spring Break: March 14-18 (no assignments)

Credit: Students who satisfactorily complete all requirements and submit the final ePortfolio will receive 1 credit of UE 499 Independent Study.

Location: Online, following group orientation session. The 6-week pilot course is asynchronous with walk-in lab hours as well as instructor online support

Other Dates and Times:

Pilot Capstone Orientation: Monday, February 29, 5:30 pm, CEI Open Student Forums: [TBA]

*Volunteers are asked to attend the orientation session and participate in one or more of the 3 open student forums

COURSE DESCRIPTION

The Pilot Capstone is a 6-week mini course designed to be a trial run of the full UB Capstone course beginning Spring, 2017. The UB Capstone will be the culminating experience of the general education program, the UB Curriculum. The Capstone is not a seated class, but rather a digital space set aside for thinking, reflecting and weaving together elements of the program through the creation of a Capstone ePortfolio: a multi-media, web-based platform where students will gather and integrate their learning experiences at UB into a meaningful whole, demonstrating their growth and development as learners.

The Pilot Capstone will include selected components of the full Capstone. A completed Pilot Capstone ePortfolio will consist of:

- A personalized home page that serves as a brief introduction to the student, his or her studies, co-curricular work and career goals.
- A learning philosophy statement which describes the student's current beliefs and approach to learning and how this has evolved since enrolling at UB, including the influences that UB instructors and coursework have had on the student's learning philosophy.
- Examples of completed papers and assignments from various areas of the student's undergraduate coursework.
- One reflective essay that seeks to integrate various aspects of the student's undergraduate learning experience.

- Any additional optional materials the student chooses to add, such as resume or portfolio of completed work, or summaries of study abroad or relevant extra-curricular experiences central to the student's growth as a learner.
- One or more ePortfolio pages that draw upon the multi-media design features of the digital platform. Students will be provided with ample technical training and support in digital writing and composition in multi-media formats.

COURSE PREREQUISITES

Student volunteers for the Pilot Capstone may be juniors or seniors from any major or transfer students with junior or senior status who have completed a minimum of 60 credit hours.

COURSE REQUIREMENTS

- Attendance at the **Pilot Capstone Orientation** session Monday, February 29, 5:30 pm [location TBA] and participation in one or more of our 3 **Open Student Forums** [dates and times TBA]. The Open Student Forums will provide a place for students to discuss their experience with the Pilot Capstone Course with instructor, peers, and CEI staff members to offer suggestions for greater effectiveness of assignments, and to share any other concerns or questions).
- On time completion of weekly online discussion topics and assignments (listed below)
- Participation in pre and post student surveys to aid in the assessment of the ePortfolio program and to provide feedback to instructor and administrators.

STUDENT LEARNING OUTCOMES

Upon completion of the Pilot Integrative Capstone, students will be able to:

Course learning outcome	Maps to the following program outcomes / competencies:	Delivered through the following instructional method(s):	Student achievement assessed with the following method(s)/assignments:
Articulate connections across different academic disciplines and perspectives.	UBGE, SUNY Critical Thinking, MSCHE Critical Analysis and Reasoning	Online Instructional Materials Tutorials Consultation with instructor	Reflective Essay ePortfolio
Adapt and apply skills, abilities, theories or methodologies acquired in one situation to new situations.	UBGE, SUNY Critical Thinking, MSCHE Critical Analysis and Reasoning	Online Instructional Materials Tutorials Consultation with instructor	Reflective Essay ePortfolio
Connect relevant experiences and academic knowledge.	UBGE, SUNY Critical Thinking, MSCHE Critical Analysis and Reasoning	Online Instructional Materials Tutorials Consultation with instructor	Reflective Essay ePortfolio
Demonstrate an evolving sense of self as learner.	UBGE, SUNY Critical Thinking, MSCHE Critical Analysis and Reasoning	Online Instructional Materials Tutorials Consultation with instructor	Philosophy Statement

Integrate different forms of communication to enhance meaning (prose, sound, visual media).	UBGE, SUNY Basic Communication Skills, SUNY Information Literacy, MSCHE Witten and Oral Communication, MSCHE Technological Competency	Online Instructional Materials Tutorials Consultation with instructor	ePortfolio
Formulate a concept of digital citizenship and be able to fashion an online identity that demonstrates an awareness of the public/private divide.	UBGE, SUNY Information Literacy, MSCHE Technological Competency	Online Instructional Materials Tutorials Consultation with instructor	ePortfolio

Note. UBGE = UB General Education; SUNY categories in the above table are those required by the SUNY General Education Program (http://system.suny.edu/media/suny/content-assets/documents/academic-affairs/general-education/GenedCourseGuidelines_20120530.pdf), and MSCHE categories represent the areas of general education required by the Middle States Commission on Higher Education.

GRADING POLICY

Assignments will be graded based upon rubrics for each separate assignment as well as the final ePortfolio. Students will be provided with rubric criteria in advance of each assignment to be weighted as follows:

Weighting	Assessment/assignment
10%	Home Page
20%	Learning Philosophy Statement
20%	Reflective Essay
10%	Proficiency in multi-media design *(may be demonstrated on Home Page, Learning Philosophy Statement, or Reflective Essay)
40%	Overall ePortfolio
100%	

Final Grades:

Although your 1-unit independent study credit will be an “S” for “Satisfactory Completion,” I shall provide instructor feedback on separate assignments using the traditional percentage range. Percentage grades are for your information only and will not appear on your student transcript!

Grade	Quality points	Percentage
A	4.0	93.0% -100.00%
A-	3.67	90.0% - 92.9%
B+	3.33	87.0% - 89.9%
B	3.00	83.0% - 86.9%
B-	2.67	80.0% - 82.9%
C+	2.33	77.0% - 79.9%
C	2.00	73.0% - 76.9%
C-	1.67	70.0% - 72.9%
D+	1.33	67.0% - 69.9%
D	1.00	60.0% - 66.9%
F	0	59.9 or below

Incompletes (I/IU):

Because students are enrolled in the Pilot Capstone course on a volunteer basis, a grade of Incomplete (I/IU) will not be posted to the student's transcript. However, it is expected that each Pilot participant will satisfactorily complete each of the course requirements. Students unable to complete the requirements will forfeit the 1-unit independent study credit and award of Campus Cash.

ACADEMIC INTEGRITY

Academic integrity is a fundamental university value and equally expected of students in the Pilot Capstone course. Through the honest completion of academic work, students sustain the integrity of the university while facilitating the university's imperative for the transmission of knowledge and culture based upon the generation of new and innovative ideas.

- Link to the university Undergraduate Academic Integrity policy: (<http://undergradcatalog.buffalo.edu/policies/course/integrity.shtml>)

ACCESSIBILITY RESOURCES

If you have any disability which requires reasonable accommodations to enable you to participate in this course, please contact the Office of Accessibility Resources, 25 Capen Hall, 645-2608, and also the instructor of this course. The office will provide you with information and review appropriate arrangements for reasonable accommodations. <http://www.student-affairs.buffalo.edu/ods/>

SCHEDULE

Although the course is not seated and delivered asynchronously, you will be expected to maintain satisfactory progress by keeping pace with weekly milestones:

Date	Topic	Required readings/assignments(s)	Due date
Week 1: 2/29-3/4	Introduction to the Capstone ePortfolio: concept and design; Basics of Digital Literacy	Readings: UB ePortfolio Startup Guide and Visual Guide to ePortfolios Assignments: Opening Welcome Survey (online); Completion of student Home Page	Friday, 3/4
Week 2: 3/7-3/11	What is a "Philosophy of Learning"?	Assignments: Posts to "Philosophies of Learning" discussion board topics in Digication; completion of Learning Philosophy Statement	Friday, 3/11
Week 3: 3/14-18	SPRING BREAK!	NO ASSIGNMENTS!	
Week 4: 3/21-3/25	"Curating the Exhibit": Criteria for Choice	Assignments: Posting of individual "criteria" statement to online discussion board; completion of Coursework Samples page in ePortfolio	Friday, 3/25
Week 5: 3/28-4/1	"Modes of Reflection"	Reading: [Annie Dillard reflective essay: title TBA] Assignment: Discussion board response to reading; completion of Reflective Essay	Friday, 4/1

Week 6: 4/4-4/8	Peer review and self-evaluation (rubric)	Assignment: Final Pilot Capstone ePortfolio Due; exit student survey (online)	Friday, 4/8
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COURSE MATERIALS

- UB ePortfolio Startup Guide (online pdf)
- The Visual Guide to ePortfolios (online pdf)
- Digication ePortfolio (accounts provided to students)
- Other course documents posted through Digication

ATTENDANCE POLICY

Online presence: students are expected to participate in weekly online discussions and activities and to submit weekly assignments by date due. Extensions for weekly online activities or due dates of assignments may be granted for family or health related emergencies. Because the weekly activities are self-paced, students are encouraged to plan ahead to avoid conflicts with religious holidays or school athletic commitments. Extensions will be granted at the discretion of the instructor. Unexcused late work will result in a loss of 5% credit each day, deducted from the weekly assignment grade.

Physical attendance: By committing to the Pilot Capstone course, students agree to attend both the Pilot Capstone Orientation session (date listed above) and one or more Open Forum discussions.

ONLINE DECORUM

- Students are expected to maintain a respectful, professional tone in all online discussion board topics as well as material posted to ePortfolios. The practice of appropriate Online Decorum is a necessary component of responsible Digital Citizenship as well as one of the non-quantitative learning outcome goals of the Pilot Capstone course. Failure to maintain Online Decorum may result in dismissal from the Pilot course.