



IJeP

International Journal of ePortfolio

Volume 5 • Number 2 • 2015

ISSN 2157-622X



A Publication of the Center for Teaching and Learning (CTL) in the Office of the Vice President of Instruction at the University of Georgia and the Center for Instructional Development and Educational Research (CIDER) in the Division of Undergraduate Education at Virginia Tech.



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The International Journal of ePortfolio (ISSN 2157-622X) is a Publication of the Center for Teaching and Learning in the Office of the Vice President for Instruction at the University of Georgia and the Center for Instructional Development and Educational Research (CIDER) in the Office of the Vice Provost for Faculty Affairs at Virginia Tech.

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Examining the Role of Reflection in ePortfolios: A Case Study

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Extended institutional experience with ePortfolios grounded and framed this qualitative case study guided by the research question: Why, how, and with what success is reflection, as a teaching/learning process, employed among ePortfolio projects at Indiana University–Purdue University Indianapolis (IUPUI)? Thirty-two representatives of 16 varied ePortfolio projects in degree programs, campus-wide high-impact practices, and single courses participated in 27 hour-long, face-to-face, semi-structured interviews and provided supplemental documents for review. Qualitative data analysis software enabled collaborative data coding and analysis. Researchers adopted procedures to support reliability, trustworthiness, and transferability of findings throughout the research process. The nine findings cut across stereotypical ePortfolio distinctions, revealing widely shared purposes, practices, successes, and frustrations with reflection in ePortfolios. Reflection was seldom the primary motivator for ePortfolio adoption, but its importance was quickly recognized and valued. Students' limited abilities to reflect typically surprised their instructors, who then pursued a range of strategies to help students improve their reflection skills. Faculty and student understandings of reflection had multifaceted effects on ePortfolio practice and experience. Though not easy to achieve, effective reflection practice appeared to be multi-dimensional and rewarding for students and instructors alike.

The ePortfolio community has identified the need for research to enhance understanding of “the ways in which ePortfolio practices and pedagogies can effectively facilitate meaningful reflection and feedback, two strategies which have already been empirically linked to learning” (Watson, 2012, p. 3969). Reflection has long been viewed as a cornerstone of most ePortfolio practice in higher education, whether for supporting learners in making connections among learning experiences or for enabling authentic assessment of learning within programs.

At Indiana University-Purdue University Indianapolis (IUPUI), departments, courses, and campus-wide centers for coordinating high-impact practices have implemented a variety of ePortfolio projects serving a wide range of purposes. Most projects have included reflection as part of the ePortfolio development process. Looking ahead to the next stages of our campus ePortfolio Initiative, campus leaders participated in Cohort VI of the Inter/National Coalition for Electronic Portfolio Research (I/NCEPR), anticipating a focus on using electronic portfolios for assessment and accreditation. Cohort readings and discussions around the relationship between evidence and reflection shifted our interest to the ways in which reflection contributed to success in meeting varied ePortfolio projects' goals. This article summarizes the research and findings of the resulting qualitative research project conducted October 2011 through September 2014.

Related Literature

Reflection

Reflective practices to enhance teaching and learning in higher education have been designed,

implemented, and reported successfully across a range of fields and settings; however, there is no common definition of or approach to reflection. Rogers (2001) conducted a meta-analysis of seven “major theoretical approaches to reflection” (p. 37) that included a majority of well-known theorists: Boud, Keough, and Walker; Dewey; Langer; Loughran; Mezirow; Schön; and Seibert and Daudelin. His analysis informed this research study, as it offered a broad view of “commonalities in terminology, definitions, antecedents, context, processes, outcomes, and techniques to foster reflection” (p. 37).

Rogers's seven theoretical approaches produced 15 different terms to describe reflection. Rogers (2001) noted that this variability is symptomatic of general usage, where the word reflection is used “as a noun, a verb, an adjective, a process, and/or an outcome; consequently, it is difficult to determine what is intended when reflection in teaching and learning is discussed” (p. 40). He found greater agreement among the seven with respect to the defining elements of reflection:

a cognitive and affective process or activity that (1) requires active engagement on the part of the individual; (2) is triggered by an unusual or perplexing situation or experience; (3) involves examining one's own responses, beliefs, and premises in light of the situation at hand; and (4) results in integration of the new understanding into one's experience. (p. 41)

Depending on the particular theorist's understanding of reflection, Rogers (2001) observed

that reflection was often presented in phases or steps. Most theorists held that the process was iterative; reflection began with problem identification and the commitment to seek a solution, next searched for information to support a decision, and, finally, resulted in action. Key antecedents and contextual factors contributed to successful reflection. The two main antecedents included a trigger incident and an “individual’s readiness and willingness to engage in the reflective process” (Rogers, 2001, p. 42). The ideal context was carefully prepared in order to balance challenge with support for learners. While their techniques for fostering reflection varied, theorists agreed overall that guided reflection helped students achieve expected outcomes of “learning and enhanced personal and professional effectiveness” (Rogers, 2001, p. 55).

Electronic Portfolio

As with reflection, definitions of eportfolios vary widely, ranging from “compilation of best practices . . . to a fluid product meant to demonstrate progress as well as achievement” (Pitts & Ruggirello, 2012, p. 49). Current ePortfolio practices in higher education are similarly varied, usually involving “instruction, assessment, and professional development” (Watson, 2012, p. 3969), singly or in some combination. As Chen and Penny Light (2010) noted, purposes for using portfolios are driven not only by learning objectives but also by the needs and interests of stakeholders. Despite this variability, however, Brown, Chen, and Gordon (2012) confirmed, in an analysis of the 2012 AAEEBL Survey, an emerging agreement that ePortfolios spur change in the way instructors think about teaching and learning as they come to understand that “the more the learner takes charge of the format and process, the deeper the learning” (Cambridge, 2010, p. 2) and the greater the opportunity for knowledge connection and integration (Chen & Penny Light, 2010).

ePortfolios can also reveal students’ educational journey across what Yancey (2004) referred to as the multiple curricula of higher education: the *delivered* curriculum of the classroom, the *experienced* curriculum as students receive and practice the delivered curriculum, and the *lived* curriculum as students learn over time from all sources in and beyond the classroom. ePortfolios afford structured time and space for learners to understand and voice their experiences with guidance from their instructors.

Banta (2003) observed that “in addition to their usefulness in assessing student learning and development over time, portfolios can also play a role in assessing the effectiveness of courses, curricula, and even institutions” (p. 4). Many ePortfolio adopters have emphasized evaluation, assessment, or accreditation

because of the authenticity and complexity that a collection of student work over time can capture. Some practitioners use rubrics aligned with learning outcomes to communicate expectations to learners, distinguish levels of competence, and support reliability of assessments: “When utilized with student work collected in e-portfolios, rubrics provide a robust framework for assessing the many dimensions of learning through and across the curriculum and cocurriculum and over time” (Chen & Penny Light, 2010, p. 19).

Walvoord (2010) proposed key assessment practices for successful institution-wide ePortfolio implementation. Students need guidance on collecting and reflecting on artifacts, along with feedback and support to help them see the value of ePortfolio development. Focusing on improved student learning purposes could help ePortfolio proponents address the concerns of skeptical colleagues.

Beyond supplementing traditional job-seeking materials, ePortfolios can also support students’ development of professional and civic identity, as Cambridge (2010) observed:

When deeply integrated into and across the curriculum and co-curriculum, eportfolios go far beyond an enhanced resume or transcript. They can help students develop abilities essential to long-term success: the strategies and confidence to learn independently; the understanding of one’s own strengths and predilections to allow for more effective collaboration; and the reflective linking of values and aspiration with knowledge and action to enable charting career trajectories and fulfilling responsibilities as a citizen. (p. 52)

Moon (2004) similarly argued that reflection is an “essential basis for good quality (meaningful) learning” (para. 5) which, in turn, “underpins other aspects of employability” (5. para. 1) captured on employer surveys. She underscored the need for a framework such as ePortfolio to make the process of reflective learning, including transferable skills, both intentional and visible to potential employers.

Reflection and ePortfolio

No matter the original purpose for an ePortfolio project, evidence reveals a role for reflection. In addition to supporting learning outcomes or other goals, “reflective practices allow students to provide additional information on attitudes and the affective side of learning, while also encouraging consideration of the relevance and transfer of experiences and skills from one domain to another” (Chen & Penny Light,

2010, p. 13). Zubizarreta (2009) considered reflection a “crucial element” of a learning portfolio.

Reporting on I/NCEPR research on whether claims for the value of reflection in ePortfolio practice could be substantiated, Yancey (2009) concluded that “the relationship between eportfolios, structure, and reflection” (p. 7) confirmed “that established or student-created structures invite, foster, and support reflection” (p. 8). In turn, “the efficacy of eportfolio-reflective practice on students” (pp. 7-8) showed that “eportfolio reflection, as defined here, is directly related to student success” (p. 12). The research also articulated “a set of claims—and new questions emanating from them—about the materials, contexts, and practices of a new kind of reflection that students are inventing in eportfolio environments” (p. 8). The last set of findings also suggested the need for additional research into the materials of reflection, since ePortfolios created opportunities for reflection to be expressed in many forms beyond the traditionally accepted “writing as corollary to thinking and learning” (Zubizarreta, 2009, p. 26).

Reflection, ePortfolios, and our Research Focus

Many authors and practitioners confirm the close relationship between reflection and ePortfolios, leaving open the question of how instructors can most effectively foster student reflection. Given greater acceptance over the past few decades of the constructivist learning model for which ePortfolio is so well-suited, the role of instructor is pivotal (Chism, 2002). Students exhibit varied dispositions toward reflection, and the literature indicates that their readiness is highly important (Rogers, 2001); therefore, instructors must be prepared to offer them flexible guidance. Numerous strategies are available to nurture reflection. On the other hand, as Rogers (2001) pointed out, many instructors have neither “been socialized by their own educational processes” nor “received any formal training” (p. 53) that might give them the confidence to select among strategies for their students.

With so many different terms, definitions, and processes used for reflection, how do faculty and students develop the ability to make reflection a habit of mind? Is it the practices and pedagogies of ePortfolio that facilitate meaningful reflection, the practices of reflection that enable effective ePortfolio development, or a shifting interplay between the two? This inquiry has sought to illuminate these complex relationships.

The Case Study Context

This intrinsic case study is bounded by the campus of IUPUI, an urban research and academic health sciences university in the Midwest enrolling

approximately 30,500 students in 250 undergraduate and graduate certificate and degree programs.

IUPUI launched an ePortfolio initiative in 2000, with the initial purpose of assessing the Principles of Undergraduate Learning (PULs), our general education outcomes. We conducted our first pilots in fall of 2004. As we gained experience working with faculty, staff, and advisors, ePortfolio leaders came to place less emphasis on PUL assessment and institutional goals and more emphasis on the goals and benefits important to potential adopters themselves. Most early projects focused on discipline-specific assessment of student learning outcomes for improvement and/or accreditation.

In 2010, improvements in our software platform opened the door to using ePortfolios for learning and showcase purposes. Adoption accelerated, and pilot-testing of an electronic Personal Development Plan (ePDP), a developmental ePortfolio that would be started in the first-year seminar and used throughout the undergraduate experience, further boosted faculty interest and creativity. The importance of reflection in the ePDP led to increased attention to reflection across the spectrum of IUPUI ePortfolio projects. By the time this research project began in 2011, approximately 30 projects in schools, departments, and centers at all levels from first-year through doctoral study were in various stages of development.

Research Purpose, Inquiry Strategy, and Question

According to Chen and Penny Light (2010), “the value of e-portfolios lies not in the specific tool itself, but in the processes and in the ways in which the concept and the related activities and practices are introduced to students” (p. 27). The purpose of this qualitative case study is to examine the role of reflection in electronic portfolio processes and outcomes at IUPUI. The significance of the study derives from the multiplicity of ePortfolio projects established at IUPUI since 2005, with their varied “issues, contexts, and interpretations” (Stake, 2005, p. 450). The research team identified an opportunity to contribute to ePortfolio scholarship through local “insight, discovery, and interpretation” (Merriam, 2009, p. 42). The research question that guided the study is: Why, how, and with what success is reflection, as a teaching/learning process, employed among ePortfolio projects at IUPUI?

Methodology

A nine-member multi-disciplinary IUPUI advisory group met during the first year-and-a-half of I/NCEPR Cohort VI to define a research purpose and question for IUPUI. The group adopted a constructivist-interpretive

paradigm as appropriate for the qualitative research inquiry strategy pursued by this exploratory study. Given the diversity of ePortfolio projects represented on the IUPUI campus, the constructivist paradigm's assumptions of a "relativist ontology (there are multiple realities), a subjectivist epistemology (knower and respondent co-create understandings), and a naturalistic (in the natural world) set of methodological procedures" (Denzin & Lincoln, 2005, p. 24) suited the qualitative purpose of understanding and describing this diversity.

Once the advisory group identified a purpose and question, a team of four staff members pursued the research activities, periodically touching base with the larger group. All four were deeply involved with IUPUI's ePortfolio initiative and served on the project advisory group. One researcher was Director of the IUPUI ePortfolio Initiative, has been part of the ePortfolio initiative since its early days, and participated as an interviewee on use of ePortfolio in a senior capstone. Another researcher has been ePortfolio Coordinator since 2009. A third team member was an Instructional Development Specialist with the Center for Teaching and Learning. Each knew many of the research participants through professional development sessions, individual or group consulting, and other campus activities. The fourth member of the core research team was a graduate assistant and higher education doctoral candidate with a research interest in ePortfolios. The observational and reflective practice required for qualitative casework (Stake, 2005) was of interest to each of these researchers and prompted them to remain aware reflexively of their own potential biases.

Procedures and Methods

Data Collection Procedures

ePortfolio projects at IUPUI were the unit of analysis, with reflection as the topic of investigation, whether the projects were in degree programs, centers coordinating high-impact practices, or single courses. The research team used two forms of data collection appropriate for case studies: interviews and collection of supporting artifacts.

To gain insight from the broadest possible range of ePortfolio practices, the research team identified 66 faculty and academic staff members associated with all known IUPUI ePortfolio projects through two-level non-probability sampling. The ePortfolio Director sent letters to each individual via campus mail inviting their participation in a personal interview. After e-mail and telephone follow-up a total of 32 faculty and academic staff, representing 14 distinct ePortfolio projects in two centers and 10 of IUPUI's 19 schools, agreed to

participate. Further information about participating ePortfolio projects and interview participants representing these projects is provided in Table 1.

The primary form of data collection was face-to-face interview. Two members of the core research team conducted each semi-structured hour-long interview (see Appendix for the interview protocol and questions). The graduate assistant led all but one interview to maintain consistency in the interview protocol and offer a less familiar face to participants. The second interviewer, rotating among the remaining team members, assured completion of the target questions, helped probe answers with follow-up questions, and requested artifacts. Twenty-four of the interviews were individual; three of the projects requested a small-group interview. Interviewers digitally recorded each session, with permission, and took supplemental written notes.

Thirteen of the 27 interview groups provided artifacts for supporting documentation. Course syllabi constituted the largest group of artifacts, followed by instructions for reflective essays and other ePortfolio assignments, rubrics for assessing reflection and/or ePortfolio effectiveness, and online student work. All artifacts were sent to the research team electronically and catalogued.

Data Analysis Procedures

Each interview was professionally transcribed, checked for accuracy by two members of the core research team, and uploaded into computer-aided qualitative data analysis software ATLAS.ti for coding. The team deductively established a small initial code framework, which grew and changed inductively during analysis (Friese, 2011). "If we typify qualitative casework, we see data sometimes precoded but continuously interpreted, on first encounter and again and again" (Stake, 2005, p. 450).

After coding was cross-checked, two team members conducted multiple conceptual-level analyses, including cross-tabulations for groundedness and relevance, then ran deeper follow-up queries. Members reflected independently on meanings suggested by each query, then discussed their understandings to reach consensus. The graduate assistant also uploaded the artifacts into ATLAS.ti, reviewed each for related content, and highlighted relevant passages. These artifacts, while not a primary contributor to this analysis, served as a reference to clarify practices described by interview participants.

Reliability, Trustworthiness, and Transferability

To assure that the research design enables our readers to make comparisons with their own context,

Table 1
Participating in ePortfolio Projects and Interviewees Representing Them

Department, Program, or Center	ePortfolio Project Primary Purpose	Implementation Level; Scope	Representing Interview Participants	
			Sex (no.)	Role
American Studies	Course Organization	300; Courses	M	S/I
Art History	Capstone Integration	400; Course	M	F/I
Center for Research and Learning	Mentored Research Process Structure	Undergraduate	M	A
Center for Service and Learning	Civic Learning Assessment	Undergraduate	F (2)	S/I
English	Capstone Integration	400; Course	F	F/I
			F	A/I
Museum Studies	Professional Showcase	MA Program	F	F/I
Music Technology	Assessment and Accreditation	BS Program	M	F/I
			F	F/I
Nursing	Assessment and Accreditation	Doctor of Nursing Practice Program	F (2)	F/I
			F (2)	S/I
Pediatric Dentistry	Integrative Learning and Self-Assessment	Graduate/Professional Program	F (2)	F/I
Psychology	Career Preparation Course-Level Integration	300; Course 100; Course	F	S/I
			F	S/I
Social Work	Assessment and Accreditation	BSW Program	F	A/I
Spanish	Capstone Integration	400; Course	F	F/I
			M	F/I
Student African American Sisterhood	Development, co- curricular	Undergraduate	F	S/I
University College in cooperation with:	ePDP, Development	100; Courses	F	F/I
			F (5)	S/I
			F (2)	A/I
			M	F/I
			M	S/I
			M	S/I
Total				32

Note. All interviews were conducted individually except: Nursing, Pediatric Dentistry, and Spanish. Participant roles represent IUPUI campus practice of engaging qualified academic staff and administrators in student learning. M = Male; F = Female; F/I = Faculty/Instructor; S/I = Staff/Instructor; A/I = Administrator/Instructor; A = Administrator; F (no.) indicates specific number of interview participants > 1 in a particular role.

we enacted the following measures for reliability and trustworthiness.

To support reliability, two core research team members checked the transcripts for accuracy (Creswell, 2009). The two members also met semi-regularly to check the codes against the data, in order to avoid code drift. One team member conducted all data coding, while a second crosschecked the coded transcripts against the code list periodically and shared observations to support iterative adjustments throughout the process (Creswell, 2009). Once coding was completed, data analysis was systematic and iterative; the two team members reflected independently on the queries, then conferred to translate meaning from the data into findings.

The trustworthiness of these findings rests primarily upon triangulation of the variety and extent of diverse perspectives that research participants offered (Creswell, 2009; Merriam, 2009). We have also provided rich, thick description in reporting on the study to contribute to trustworthiness so that readers can draw informed conclusions about applicability in their contexts (Creswell, 2009; Merriam, 2009; Stake, 2005).

Findings

Each finding below describes understandings reached through recursive data analysis. The flow of each interview was conversational, and we have illustrated each finding with selected direct quotations from the interview transcripts. Just as we did not impose a single definition of *reflection* in our interviews, we accepted participants' use of other terms such as *metacognition*, *integrative learning*, or *assessment*. In nearly every case, participants used terms in their common English meanings without reference to particular theories. We note in the discussion of Finding 4 and under the general Discussion heading the comparatively few instances where participants' understandings appeared to influence emerging patterns in the data.

One of the most noteworthy results of this study was that it illuminated the commonality of experience and practice with reflection in ePortfolio projects across disciplines and levels of study. Mindful of our qualitative approach and small sample, we have chosen not to quantify our data as we illustrated our findings. Use of quotations "shows" data where we can; in other cases, we have used general description to indicate depth or frequency of themes we discerned.

Finding 1: Few of Those Adopting ePortfolios Began With Reflection as a Primary Goal.

Respondents usually described their primary motivations as some combination of interests: to enhance student learning, assess student learning, foster

student development, facilitate particular pedagogies, prepare for program accreditation, enhance searches for internships, employment, and/or graduate school, undergird advisement, and assess course or program curricula.

On the other hand, some did identify reflection as a secondary goal. For example, one instructor recalled that "someone had heard about ePortfolio and said 'This would be a useful . . . reflection tool for the capstone writers to reflect on their career as art history students.'" Another faculty member reported that

we are very interested in training self-reflective practitioners and saw this as a tool to help them both synthesize the sort of disparate learning experiences they'd had across their graduate program, also to kind of put themselves into that equation.

A staff member of a major center said, "it was through . . . thinking about reflection, talking about ePortfolio as a mode for reflection, not just a receptacle where reflection can occur, that kind of sparked my interest."

These differences of approach mirrored the diffuse understandings of the term reflection that respondents brought to their work. When asked for their own definition of reflection, only three cited theory. Several provided contextual definitions (e.g., service learning, first-year experience, doctoral degree program) or shared an illustrative story. A few observed that their understandings continued to develop. All respondents did see reflection as a process, generally a metacognitive process, though the shorthand reference to "a reflection" as the product of reflective thinking (typically an essay) also appeared regularly. Phrases commonly put forward to describe reflection included:

- Deep thinking or critical analysis;
- Stepping back, or pausing to consider your learning experiences to date in order to determine how to move forward;
- Making connections;
- Integrating learning;
- Realistic self-assessment, examining assumptions.

One advisor provided a vivid illustration:

The sankofa bird [from African mythology] . . . faces backward, but it flies forward. . . . Reflection, for me, is a constant movement forward while continually evaluating things that have happened in your life, be it significant or insignificant things, and how they still continue to try to propel you to move forward. When I think of reflection, I think of the sankofa bird.

Finding 2: Whether or Not Adopters Initially Understood the Importance of Reflection in ePortfolios, Most Recognized and Prized That Role Within the First Term of ePortfolio Use.

This recognition of the value of reflection extended across the commonly recognized types of ePortfolios (assessment or accreditation, teaching and learning, developmental, showcase) as well as across levels of study (first year through doctoral) and learning contexts (curricular, co-curricular, extra-curricular). Purposes most commonly articulated for reflection included:

- To cultivate habits of mind;
- To deepen learning through iterative consideration, questioning assumptions;
- To connect different aspects of educational experience;
- To take responsibility for one's own learning;
- To develop identity as a learner and/or as an emerging professional.

In addition, faculty often articulated benefits for their teaching as they recognized that reflection extended their understanding of student learning, engagement, and/or development. One professor explained:

I think that when you write, and particularly when you write reflectively, it's an embodiment of your thought processes. It's really in the writing that the thinking is clarified, that one is able to draw connections that ordinarily we're not able to draw because our working memories are limited. . . . I've come to think that this is not only an incredibly impactful form of assignment for students to do, but it's also a way that instructors can be assured that the way that they've designed their class, the way that they've been trying to help students learn, is working or not working. I think it is the place where learning is captured.

Finding 3: Instructors Expressed Surprise at Students' Limited Ability to Reflect, and They Subsequently Devoted Considerable Effort to Helping Students Learn How to Think Reflectively.

This concern recurred among graduate and undergraduate faculty alike. Two faculty in a graduate professional program commented, "They're very bright, and they're very convinced that they're bright, so it's difficult to always make them believe that you could look at anything differently." As one instructor of 300-level courses put it, "I'm consistently surprised, and disappointingly so, in how many students, how new an experience or an idea this still seems to some of these

students, to think broadly across a topic. I don't know if it's that they've never been asked or they're afraid of it."

Certainly, instructors of entering students were more likely to anticipate these challenges. Yet even these instructors were sometimes taken aback by the wide variation in student ability to reflect. For example, to help students make connections, the ePDP that IUPUI students begin in their required First-Year Seminars tightly aligns course activities, reflective assignments, and ePDP sections with course objectives and student learning outcomes. Nonetheless, one FYS instructor accustomed to teaching capstones, but using reflection in the ePDP for the first time, observed, "I went from hoping that students would draw these deep connections to hoping that they would just simply answer all parts of the question." Most faculty at all levels reported having to lower their expectations, at least initially.

Though the need to teach reflection took faculty by surprise, their willingness to create that time and space testifies to the benefits they perceived. In many cases, the pedagogical improvements instructors reported making as they gained experience with ePortfolios focused more on fostering reflection than on enhancing course content. The new FYS instructor again:

I was very underwhelmed at my own ability to be impactful as a teacher. I didn't have a great semester. I'm actually really looking forward to this fall as a do-over. We've taken a lot of that stuff out [activities that interfered with time for reflection].

Finding 4: The Purposes of Reflection Related to Wide-Ranging Course or Programmatic Objectives, but May be Summarized in Two Primary Categories: to Help Students Make Connections and to Build Self-Understanding and Metacognition.

The connections sought were diverse:

- between units within a course, out-of-class experiences and in-class curriculum, and/or lived experience and formal learning;
- across groups of courses, whole degree programs, and/or distinct high-impact practices (e.g., undergraduate research, study abroad);
- among interests, aptitudes, possible careers, and related majors; and
- between professional standards and work completed in field experiences.

One course instructor described his purposes for student reflection this way:

If they're showing me evidence of being able to pull in different kinds of interests, different kinds of references, text material, class discussions, conversations they've had with friends, if they're showing evidence of being able to pull all those things together and relate them to whatever particular area they're investigating, that's what I was really after.

As we listened to respondents, we identified distinctions between making connections and integrative learning. Though all respondents used the phrase "making connections," those who spoke more explicitly about integrative learning were largely those engaged with upper-division undergraduate and graduate students. A similar distinction emerged between self-examination and metacognition, though respondents introduced the latter term less frequently.

One advisor in a co-curricular setting vividly described challenges in encouraging student self-understanding and its importance:

I have students who say "I left there, and I'll never go back there. . . . I'm not going to talk about it, period." But I try to show them how acknowledging and opening that door helps them to be able to propel forward. Because you have to know that. I look at it from that holistic standpoint, so that they can make sense out of who they are going to be as a learner and fully engage in their learning process and their experience.

Finding 5. Instructors Reported Using a Range of Approaches to Elicit Reflection Appropriate to the Context.

Once again, methods recurred across levels of study; for instance, instructors in 100-, 300-, and 400-level courses named modeling as one of their approaches to help students understand and adopt habits of reflection. For example, First-Year Seminars employ peer mentors who help with technology and advocate for the ePDP, while a master's degree program relies on previous student cohorts to model reflective showcase ePortfolio preparation. We identified five clusters of approaches commonly used:

- Explanation and advocacy
- Demonstration and practice
- Assignments
- Social pedagogies
- Formative (feedback) and summative assessment

Table 2 provides detailed examples of these practices.

For beginning students, making connections between visits to work environments and skill sets identified through standardized tests provided a course-relevant assignment for reflection. Tightly focused questions (expected to be answered directly, with points deducted for omitting a question) helped these students learn to craft personal essays. Students in a senior capstone course, though often still needing support, generally required less prescriptive guidance. In fact, one capstone professor noted,

I found that if you give enough direction to allow a weaker student to complete the assignment with reasonable success, that is way too much for a better student. What the better students in some cases really directly articulated was their sense that maybe they were being told what we wanted them to say. That was because they already could think these questions through.

Finding 6. Assessment Practices Vary Widely According to Both Students' Abilities and Instructors' Understandings of Reflection.

Instructors who understood reflection as primarily affective were uncomfortable assessing reflective essays. As one first-year advisor put it, "How can you grade reflection? . . . It's like grading somebody on their opinion of something." Some simply felt that completing the exercise was sufficient: *what* students thought mattered less than *that* they thought about the target of reflection; students received credit for completing the assignment, but no grade. Some "split the difference" by providing detailed feedback on drafts, but not grades on a final product. Others, especially those in disciplines accustomed to distinguishing content from expression or assessing on the basis of sufficiency of evidence, usually did conduct both formative and summative assessment of reflective assignments.

Several faculty distinguished between kinds of reflection assignments in determining whether and how to assess them. Assessment decisions sometimes varied by level of study. One first-year faculty member explained that since "About Me" reflection is intended to help students think honestly about their interests and strengths, grading should be more developmentally encouraging than in capstones, where disciplinary approaches to addressing complex problems are established and therefore demand more rigorous assessment.

While somewhat intrigued with multi-modal presentation, several faculty questioned their ability to assess reflection expressed in modes other than written text. Nearly all described their reflection assignments as written essays, with occasional references to oral

Table 2
Practices Commonly Adopted to Foster Reflection in ePortfolios

Practices	Activity Examples
Explanation and Advocacy	Instructor explanation, description, expectations, and suggestions (in class and in syllabus), beginning the first day and aligned with learning outcomes Building student investment in personal benefit of reflection Assigned reading about reflection, often with subsequent class discussion
Demonstration and Practice	Showing (and discussing) reflective essay examples Instructor modeling of reflective practice (pausing in class to call attention to his or her own reflective process or to describe personal experience with peer feedback) Collaborative instructor highlighting of connections between linked courses Low-stakes practice exercises, with or without the opportunity for revision, including stepped preparatory assignments Assignment of journaling (or lab notebooks) as precursor to formal reflective essays
Assignments	Using clear, common structures for assignments across course or program Layering assignments to complete a project in stages Clustering assignments to clarify their connections Posing leading questions or prompts Allowing pauses for ideas to percolate, lessons to be absorbed Pulling in alternate modes to reinforce or duplicate reflection (e.g., visuals, engaged practices, shifting format from matrix or outline folio to presentation portfolio)
Social Pedagogies	Peer modeling by course mentors or by students in advanced cohorts Beginning with group discussion (oral practice), then shifting to individual written practice and vice versa Peer feedback in ad hoc or extended groupings (or occasionally a considered decision not to use peer feedback)
Formative Assessment	Informal instructor feedback (on drafts and/or on graded assignments), summative often extended and conversational, sometimes in person Customized approaches to summative assessment, including small groups of faculty (with or without subsequent evaluative comments to students), faculty and field supervisor consultation, as well as oral presentations to peers and/or external guests

presentations of ePortfolios. Beyond these familiar academic modalities, they were uncomfortable. For example, “One student asked if they could write a song or a series of songs to represent their experiences. Fabulous idea, great idea, but how do I assess that? . . . I’m not trained in song structure or anything like that.”

More often, interviewees articulated challenges with respect to writing: in particular, a close relationship between writing ability and reflecting ability. Expressing the perception that lack of

writing skills limited effectiveness of a reflective essay, one instructor commented:

They were mentioning material that we’d read in class, and they were active in class discussions, so clearly they were engaged, but they just weren’t very good writers. . . . The ideas were there, but they were unstructured. Because they were unstructured, they lacked in places maybe some supporting detail that students who were better

writers just naturally incorporated. It was difficult at times to fairly assess them.

To offset that difficulty, another instructor described spending class time on oral reflection as a means of helping students “practice reflection in a way that they’re more comfortable.”

Sensitivity to the needs and abilities of their students was a hallmark of most of our respondents. One instructor who teaches a First-Year Seminar for students who have not yet declared a major explained why she flatly refuses to use peer feedback: “That’s just not valuable time, for them to be critiquing each other in this. Plus, they’re pretty sensitive right about now and they’re talking about stuff that’s pretty personal. I’m just not opening that can of worms.” As a capstone instructor explained,

You’re bringing in your recognition that you’ve got somebody who’s maybe been pretty slick all his life and is a good thinker, is basically a good person, but he’s been coasting on charm a lot of the time. Because this is a good person and not a con artist, you can then sort of work with “okay, you know, this is really nicely written . . . but there’s not maybe as much substance as there might be.”

Finding 7. Many Respondents Perceived Students as Achieving More Successful Reflection With Self-Evaluation Than With Integrative Learning.

Beginning to build self-knowledge is an important developmental criterion for the first-year ePDP, and these instructors valued the way reflective essays could demonstrate learners’ growing awareness of individual academic identity as well as acceptance of responsibility for their own learning decisions. Even within a single course, one noted: “I’m not sure how you articulate that, but you can see a difference from their About Me to what they wrote in their Career Goals. There’s a different level of maturity, almost.”

Capstone and graduate faculty, however, also remarked on ways that well-prepared reflective essays include self-evaluation—here sometimes using terminology of metacognition. One respondent explained: “The good reflective essays are the ones that do link their work because there is also some self-evaluation in the interface.” Even at the graduate level, “For usually a few students each year, it’s that light bulb kind of moment. ‘Oh, that’s why I’m drawn to this kind of work!’” Nonetheless, instructors struggled to help students achieve depth in integrative reflection, generally with uneven results:

We hoped that the experience of putting together some artifacts and looking back at their work from

early on and comparing—one of the reflection questions is “Does your work demonstrate a trajectory of development?” We try to guide them in that direction; we try to prompt them. We certainly saw that in some students and not in others.

Finding 8. Respondents Often Described Success in Terms of Seeing Evidence That Students Had Learned and That the Program or Course Had Value for Their Students.

The word *transformative* seems appropriate for the levels of success some reported. For example:

To see where they were two and a half years ago, and then to read from their own voice, in their own voice, how transformative the program had been for them, how it broadened their view and opened their eyes and made them a different practitioner and different leader—really, really gratifying . . . The students seemed to use their individual ePortfolios as a transformative, reflective learning experience.

From another: “You feel that the experience of putting the portfolio together and writing reflections has really been successful and has made an impact.” And “There’s reflection there, but it’s personal reflection, it’s not—honest—from us, it’s coming from them, which to me means they’re actually learning.” One instructor said, “it really gave [the students] a sense of their competency and increased their confidence in what they were doing. I think when it works, it works great.” Or another, speaking of first-year students: “I love watching them start to think and see these light bulbs come on.”

Some faculty, of course, defined success with reflection in terms of accomplishing course or program learning outcomes. For example, a team from a senior capstone noted, “They actually do a pretty good job about saying, ‘Well, when I learned about these dialects in linguistics, then I could see it when I read this piece from this particular country.’ It’s very revealing for us.” In a 300-level course,

The level of writing I got out of those students as the semester went on was incredible. I mean it bordered on just eloquent, some of the observations that they would make . . . I’m positive I wouldn’t have gotten that level of writing out of them, that quality of writing, if it had been in a more traditional format.

Or “If they show that evidence of being able to think more broadly, holistically across the topic, and beyond the topic, that’s a success.”

Finding 9. Respondents Also Noted Direct Benefits for Themselves and Their Projects From Improved Understanding of Their Own Curricula as They “Closed the Loop” on Their Assessment and Reflected Ever More Deeply on Their Own Teaching Practice.

For some projects, especially those identified as assessment-focused, curricular improvement is an important desired outcome, and the reflective ePortfolios typically met such goals. One program director noted, “We made a change, a major curricular change in 2009, and a lot of that was due to the way we’re doing the capstone portfolios.” Another group reported on the benefits for faculty in thinking holistically about courses in their program:

I really think it made for a much higher quality of course development . . . It not only made it more clear how their own course material related, but it made [faculty] much more knowledgeable about what was being taught in other courses, how all of it fit together to achieve the program outcomes and standards.

Plans to expand ePortfolio adoption provide another indicator of success. In some cases, experiments with reflective ePortfolios in a capstone spurred interest in introducing ePortfolios earlier in a program: “We decided that the ePortfolio would be much more useful if they’d had it for four years rather than one semester at the very, very end.” In another case, experience in a First-Year Seminar is leading to expansion into subsequent courses: “It was because of my experience in that FYS that now . . . we’re going to drive it into the program.”

Discussion

The use of reflection as a teaching and learning practice is certainly not unique to ePortfolio adopters but, as the preceding literature review observes, ePortfolios and reflection are allied practices. Nonetheless, educators who adopt ePortfolios invariably seem surprised by the importance of reflection. Our own findings indicate that this realization is largely welcome and that reflection subsequently becomes a focus of teaching and learning that brings numerous benefits. As we noted, the challenge arises from the extensive support many students need in order to learn to reflect. Several instructors did explain that, with experience, they tried

to integrate the reflection and/or ePortfolio work more fully into the whole of the course or program rather than, as they may have done initially, simply adding ePortfolios as a new component.

Choices of instructional strategies varied according to the kind and level of reflection desired (e.g., affective, integrative, metacognitive). Some adjustments of approach, on the other hand, were grounded in instructors’ understanding of their students’ maturity as learners, with prescriptive assignments and clear rubrics often preferred for entry-level students and suggested ideas and topics for more advanced students. Those adjustments depended primarily on the experience of the instructors, but were also indirectly influenced by their concepts of reflection.

We observed that instructors’ varied understandings of reflection also influenced their decisions about how to use and whether or how to assess reflection. The differences among major theories found in the literature on reflection were evident among those we interviewed as well. Our interviews revealed connections between decisions about whether and how to assess a reflective essay and understandings of the nature of reflection as personal/affective or academic/cognitive.

In addition, our findings highlight the tension between common faculty (mis)perceptions of assessment and their understandings of reflection. The more dubious the interviewees about assessment as they understood the term, the less likely they were to believe that reflection could or should be assessed. Some members of this group of interviewees voiced assumptions that assessment required elaborate rubrics with numerical scores, multiple-choice tests, or multiple external reviewers. The more the interviewees believed reflection to be a matter of personal expression, the less likely they were to grade such an assignment (though they might well provide substantial feedback, not recognizing that as formative assessment).

Several of our findings have implications for enhancing professional development for faculty, advisors, and others who work with ePortfolios. Preparing instructors to recognize the importance of reflection—and the likelihood of student difficulty in reflecting—can help forestall some of the dismay, regret, and/or mid-semester reinvention we heard about during the interviews. Identifying the ways in which one’s understanding of reflection might influence instructional decisions can help assure that choices are based on intended learning outcomes rather than on unrecognized assumptions. Moreover, though we do not advocate forcing everyone to adopt a single “right” definition of reflection, both faculty and students can benefit from awareness of the multiplicity of understandings, so that, for example, students can avoid

responding to one instructor's reflection assignments based on another's explanations of reflection the previous semester.

We noticed several other topics that appear ripe for focused professional development and also future research. As noted, written text is by far the most pervasive form of reflective expression assigned, despite the potential benefits for students of the multimodal forms of expression ePortfolios make possible. Seminars and communities of practice might foster familiarity with alternatives like photographic essays, digital storytelling, and songwriting while developing strategies for assessing reflection presented via alternate modes. Colleagues from rhetoric and composition as well as art, music, and visual communication can help advance our collective practice. In addition, we see opportunities to improve understanding of why and how to assess reflection in ePortfolios, and of the benefits of reflection for assessment ePortfolios.

In informational workshops and conference presentations, we have often heard faculty express concern about adopting ePortfolios because they will require significant additional work. In our interviews, we observed that some instructors felt obliged to provide extensive written (and sometimes oral) feedback to students, especially on more personal reflective essays. We posit that these circumstances may help explain the "extra work" reputation; if so, then scaffolding of reflection assignments and options for use of peer or external feedback may be other subjects for attention in professional development. Further research on the accuracy and source of the extra work perception appears warranted.

Finally, because so many interviewees remarked on their greater success with more elementary levels of reflection (making connections and self-awareness), professional development might focus on effective ways to elicit more advanced forms and greater depth of reflection (integration and metacognition). In this area of development, approaches might include extended seminars, communities of practice, or mentoring.

Limitations

The project team maintained awareness of potential limitations, and our design attempted to minimize the potential impact of the three we considered most relevant in our research context, as described below.

Backyard Research

Familiarity can be a challenge for researchers conducting case research in their own backyards. According to Creswell (2009), familiarity "often leads

to compromises in the researcher's ability to disclose information and raises difficult power issues" (p. 177). To address research trustworthiness, we employed two strategies in addition to having the graduate assistant act as lead during interviews. First, we minimized the role of the team leader in analysis, since she was also an interview participant. Second, we took measures (mainly through informal discussion and notes generated during analysis) to maintain awareness of researcher reflexivity and the ways in which it might influence thinking.

Sample

As noted in the Methodology section, we invited all known IUPUI ePortfolio projects to participate in this study, hoping that multiple participants from the larger projects would offer different perspectives on our research question. Some projects were represented by a single interview with one person; three involved single interviews with two to four representatives; two projects were each represented by two separate interviews with individual faculty; one large project was represented by 12 individual interviews. We offset the potential imbalance among smaller and larger projects by focusing analysis on ePortfolio project purposes (i.e., assessment, learning, development, and so on) and on levels of study (i.e., first year, senior capstone, graduate program, and so on) rather than overall proportion of different responses. At the same time, we acknowledge the possibility of socially constructed influence on responses during the three group interviews.

Boundaries of Time

Interviewees had varied amounts of experience; several were only in their second semester of using ePortfolio, while others had several years of experience. In itself, this enriched rather than limited the information gathered through interviews. On the other hand, the IRB restricted gathering of supporting data (in the form of course syllabi, assignments, sample reflective essays, and sample student ePortfolios) to a single academic year. Since it proved impossible to limit the content of interviews to only an equivalent time period, the artifacts we collected proved less useful than anticipated.

Conclusion

Reflection in ePortfolio projects can foster many forms of student success, as our interviewees repeatedly explained. Those new to ePortfolios, even those with interest in reflection at the outset, seldom anticipated the range of learning opportunities reflection offered,

much less the number of challenges they faced. Despite stereotypes about types of ePortfolios or capabilities of students at different levels, ePortfolio practitioners appeared to share purposes and practices, frustrations and successes, professional growth and rewards. Our findings suggested numerous opportunities for expansion of faculty development and sharing of research across disciplines that, given reflection's central importance in ePortfolio practice, should benefit the growing field.

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Appendix

The Role of Reflection in Electronic Portfolio (ePortfolio) Processes and Outcomes at IUPUI

Faculty and Staff Individual Interview

Construct Date: January 30, 2012

Interview Specifications:

- Date: _____
- Time: began at _____ (a.m./p.m.), and ended at _____ (a.m./p.m.)
- Number of invited participants: _____
- Number of actual participants: _____
- Room Setting: _____ Private _____ Semi-Private _____ Public
- Room Location: _____ (building) and _____ (room name/no.)
- Format: interview questions tailored to individual
- Recorded: _____ Yes _____ No
- If Yes to above, were appropriate permissions secured?: _____ Yes _____ No
- Interviewer(s) (please print): _____

- Participants (please print): _____

- Rich description: _____

Pre-Discussion Statement:

Researcher(s) reads following statement to discussion participants after they have agreed to participate in the discussion group interview:

As the leader of an ePortfolio project, thank you for being willing to participate in this individual interview focused deeply on your perceptions about the role of reflection in your ePortfolio projects. There are no foreseen risks associated with participation in this conversation. You can opt out at any time. All answers will be confidential, and our discussion should take no more than 1.0 hour. We would like to ask your permission to digitally record this interview? Do you have any questions before we get started? I will give you my business card and you are welcome to use it to contact me if at any time you have questions after this interview concludes.

General Introductory Questions: General Introduction

- What prompted your initial interest in having your students use/develop ePortfolio?
- Tell me about your experience of preparing to teach the ePortfolio component in your curriculum.
- How did your students respond initially to the overall concept of the ePortfolio?
 - How did these initial responses change over the course of developing their ePortfolio?
- How do you feel about the role of reflection in the ePortfolio process?
 - How would you define “reflection”?
 - Tell me about how your students were able to use reflection in building their ePortfolio.
- What kinds of relationships among artifacts did students identify?
 - What evidence do you have of how students perceive such relationships?
- Do students assess their work differently when they see multiple artifacts together?
- What role does reflection play in students’ understanding and integration of the artifacts?
 - What does all of this mean for ePortfolio practice and authentic assessment?

Thematic Questions

Re. Purpose:

- What was the purpose of reflection in your particular context?
- How was reflection expected to support and/or demonstrate student learning in that context?

Re. Learning Context:

- How do you define reflection in the context of your discipline or course?
- What is/was the framework for reflection?
 - Single course?
 - Program?
 - Engaged practice such as research or service?
 - In what field and at what level of study?

Re. Basis:

- What is/was the basis for student reflection?
 - One or more experiences?
 - Single piece of work?
 - Cumulative body of work?
 - Other?

Re. Process:

- How is/was reflection fostered?
- What questions or directions are provided?
- What genres are encouraged or permitted?

Re. Assessment:

- How was reflection assessed?
- By whom and according to what criteria?
- Are some kinds of assessment more appropriate for different types of reflection?

Re. Environment:

- How does the ePortfolio environment contribute to successful or effective use of reflection?

Re. Evaluation:

- By what standards was a use of reflection judged successful?

Integrating ePortfolios into Sustainability Education

Geoffrey Habron
Warren Wilson College

Given the importance of applied learning and skills needed in sustainability education, this study sought to explore how electronic portfolios enable students to provide a range of evidence to demonstrate their sustainability learning. Michigan State University developed an undergraduate minor on sustainability that required students to provide portfolio evidence of learning in eight required competency areas. Analysis of portfolio contents during 2011-2013 demonstrates that students most frequently addressed Ecological Integrity and Civic Engagement competencies and least often submitted evidence that addresses Personal Awareness and Aesthetic Understanding. In terms of sources of evidence, students most often submitted evidence from their required sustainability capstone and practicum courses, followed by elective academic courses and the required introductory course. Students least often provided evidence from non-curricular experiences. A major drawback to the approach was a student tendency to wait until the final semester to work on the portfolio. Given the change in pedagogy and approach from the standard institutional practice, students would have benefitted from a more structured and formal portfolio orientation program.

Education for Sustainability

Education for Sustainable Development, a global movement, has as its central concept the aim of facilitating the acquisition of knowledge, skills, and values to enable people to participate in local and global decision-making that will improve the quality of life now and not damage the planet for the future. (Glover, Jones, Claricoates, Morgan, & Peters, 2012, p. 76)

The United Nations designated 2005 to 2014 as the Decade of Education for Sustainable Development (ESD), which “aims to help people to develop the attitudes, skills and knowledge to make informed decisions for the benefit of themselves and others, now and in the future, and to act upon these decisions” (United Nations Education Science and Cultural Organization, 2012, para. 1). The United Nations ESD effort strives to: (a) foster monitoring and evaluation; (b) encourage a research agenda and serve as a forum for relevant research on ESD; and (c) share good ESD practices. Given the need to design, test, document, assess, and improve the knowledge and performance of education for sustainability programs (Barth & Thomas, 2012), as presented in the U.N. Decade of Education for Sustainable Development, this study sought to explore how electronic portfolios enable students to provide a range of evidence to demonstrate their sustainability learning.

To foster education for sustainable development effectively, higher education programs need to address the problematics and promise of sustainability within institutions by incorporating interactive approaches, engaged discourse, systemic learning, and whole systems design (Corcoran & Wals, 2004). Education for Sustainable Development shifts the focus from a

traditional educational emphasis on teaching and inputs toward achieving competencies (Anderberg, Nordén, & Hansso, 2009; Barth & Michelesen, 2013): “Simply put, competence can be defined as what the students will be more capable of doing after completing the learning activity. Competences are written as verbs, as the ability to do something” (Mochizuki & Zinaida Fadeeva, 2010, p. 392). A difference exists between the concept of a competency viewed in terms of a learning outcome or skill and the concept of competence viewed as an accomplished level of proficiency capable of high performance. This paper discusses the former and not the latter.

Several efforts identify a range of important competencies that sustainability education programs should consider as learning outcomes (Anderberg et al., 2009; Barth & Michelesen, 2013; Higher Education Partnership for Sustainability [HEPS], 2004; Mochizuki & Zinaida Fadeeva, 2010). However, such synthetic compilations address neither how to infuse such process dimensions into the curriculum nor how to assess the competency of those learning about sustainability (Glover et al., 2012; Karlin, Davis, & Matthew, 2013; McKeown, 2011; Yousey-Elsemer, Keith, & Ripkey, 2010), as Sterling (2010) notes: “To date, a sustainable education paradigm has been infrequently practised, particularly in mainstream formal education” (p. 525). This occurs despite an admonition to utilize a learner-centered approach in sustainability education (HEPS, 2004). Similarly, a recent call has encouraged education for sustainability researchers to develop a more focused synthetic agenda, as reflected in two overarching questions: first, “how is sustainability implemented in the curriculum, and second, how and under what circumstances do students develop the necessary capabilities to contribute to a more sustainable future?” (Barth & Thomas, 2012, p. 9). Despite the growth of

sustainability programs, a lack of program assessment appears in the literature (Glover et al., 2012; Karlin et al., 2013; McKeown, 2011; Sterling, 2010; Yousey-Elsemer et al., 2010).

ePortfolio Assessment

The rise in sustainability education efforts falls within the larger context of United States higher education, which includes greater attention to accountability and assessment in higher education (Arum & Roksa, 2010; Hacker & Dreifus, 2011; Schneider, 2012). To provide more effective assessment-centered environments, educational programs should provide frequent and ongoing feedback in order to expose students' thinking and understanding in a variety of modes.

To better address more holistic and authentic approaches to learning assessment, electronic portfolios have gained attention particularly within the Association of American Colleges and Universities (AAC&U). Terrel Rhodes (2010a), the Vice President for Quality, Curriculum, and Assessment for AAC&U, stated that the use of "electronic student portfolios recognizes that learning occurs in many places, takes many forms, and is exhibited through many modes of representation" (p. vi) and that "electronic portfolios have emerged as a powerful means for deepening student learning and for demonstrating achievement of the broad set of essential learning outcomes needed by today's students" (p. viii-ix). Importantly, ePortfolios "offer insight into the process by which students learn, rather than just an end product" (Chen & Penny Light, 2010, p. 3). In particular, a portfolio serves as an appropriate and unique assessment tool that "captures evidence of student learning over time—in multiple formats and contexts—documents practice, and includes a student's own reflection on his or her learning" (Chen & Penny Light, 2010, p. 1). Portfolios also encourage students to represent and integrate their formal and informal learning experiences (Chen & Penny Light, 2010; Peet et al., 2011; Richards-Schuster, Ruffolo, Nicoll, Distelrath, & Galura, 2014). This provides a much richer explanation of learning than grades, credit hours, and transcripts (Chen & Penny Light, 2010; Schneider, 2012; Tagg, 2003).

Academic Program Overview

To integrate best practices in portfolio learning and sustainability education and to enable assessment over a long temporal horizon (Tagg, 2003) and across multiple modalities, Michigan State University launched a 2010

minor in sustainability that centers assessment on the use of portfolios (Habron, 2012).

Learning Outcomes and Competencies

As suggested by best practice in curricular (Wiggins & McTighe, 1998) and portfolio design (Chen & Penny Light, 2010), the program is based on specific learning outcomes (Chun, 2010; Fink, 2009) in the form of competencies required for sustainability learning. The program requires that students achieve wholeness and balance in terms of synthetic and integrative learning among the following eight competency areas: (a) Personal Development, (b) Critical Thinking, (c) Civic Engagement, (d) Systems Thinking, (e) Social Equity, (f) Economic Vitality, (g) Ecological Integrity, and (h) Aesthetic Understanding (Habron, 2012; Michigan State University, 2014a). The specific configuration of the approach makes explicit the interdisciplinary nature of sustainability by including content-based competencies that form the basis for disciplines and majors (Social Equity, Economic Vitality, Ecological Integrity, and Aesthetic Understanding), the focus on learning outcomes, as well as development of learners in terms of more process-based competencies (Personal Development, Critical Thinking, Civic Engagement, Systems Thinking). The competencies represent a mix of outcomes across a range of domains (foundational knowledge, caring, application, integration, learning how to learn, human dimension) that provides greater likelihood of producing significant learning experiences in which students are engaged, in which student effort produces significant and lasting learning, and in which the learning produces added value (Fink, 2009).

The integrative learning required for sustainability (Karlin et al., 2013) and the specific sustainability program matches well the kinds of integrated knowledge assessment befitting a portfolio approach (Peet et al., 2011). Each competency contains seven to eight learning tasks, with higher numbering representing more complex tasks according to Bloom's Taxonomy (Michigan State University, 2014a). For example, critical thinking has seven associated tasks, numbered 1-7. While the first critical thinking task (CT-1) requires students to simply "Define and explain critical thinking and the indicators one can use to identify critical thinking in the works of others," the sixth and more advanced critical thinking task (CT-6) requires students to develop a higher order task: "Propose a plan of action to mediate multiple stakeholder concerns." Students acquire and demonstrate competency through a required introductory course (ACR 187 Introduction to Sustainability), 11 elective credits, a required field project experience that addresses research, outreach,

internship, or teaching (ACR 387 Sustainability Practicum), and a required final defense of an academic portfolio to faculty, staff, students and community members (ACR 487 Sustainability Portfolio Capstone). Students can achieve program level outcomes through core courses and electives, as well as through non-curricular ways. As emphasized during student advising sessions, academic courses comprise just a subset of the total learning opportunity space.

Student Choice

To complete the program, students must compile evidence that demonstrates a basic level of two to three learning tasks in each of the eight competencies and must achieve a total of five learning tasks in each of the following process competencies: Personal Development, Critical Thinking, Civic Engagement, and Systems Thinking. Students must achieve an intermediate level by achieving five learning tasks in one of the content competencies: Social Equity, Economic Vitality, Ecological Integrity, or Aesthetic Understanding. Lastly, students must achieve an exemplary level by achieving all seven to eight learning tasks in one of the following process competencies (Personal Development, Critical Thinking, Civic Engagement, and Systems Thinking) and one of the remaining content competencies (Social Equity, Economic Vitality, Ecological Integrity, or Aesthetic Understanding). Students identify their elective credits and distribution of competency achievement in a plan of study developed in conjunction with the program director.

Students can choose portfolio material from their core sustainability classes, the electives they list on their plan of study, courses from their major field of study, other courses, or other experiences. Many students choose to develop materials within their ACR 487 Sustainability Portfolio Capstone course experience itself. A student may submit one specific artifact (e.g., ACR 187 Introduction to Sustainability weekly assignment) for one specific competency task (e.g., Civic Engagement-1). A student may submit multiple pieces of evidence (ACR 187 Introduction to Sustainability weekly assignment; ACR 387 Sustainability Practicum power point presentation) for one specific competency task (e.g., Social Equity-1). However, a single piece of evidence (ACR 187 Introduction to Sustainability weekly assignment) might qualify for multiple competencies (e.g., CE-1 and SE-1).

Based on the work of Marie Eaton at Western Washington University, students must provide reflections on each piece of evidence and each competency that discusses how the evidence meets the competency and describes the learning experience in

four domains: intellectual development, skill building, affective development, and integration/judgment.

Methods

While multiple components of the ePortfolio process exist (nature of learners, external uses of evidence, role of stakeholders, etc.), this article seeks to focus on exploring the nature of the evidence that students use. This aligns with the belief that portfolio assessment should explore the many places, forms, and modes of learning that students utilize (Rhodes, 2010a).

Participants

Thirteen students (nine female, four male) completed the program as graduating seniors during 2011 to 2013. While six students majored in Packaging, the remaining seven students were evenly distributed across Earth Science, Environmental Studies and Applications, Geography, General Management, Hospitality Business, Psychology, and Technology Systems. Participants all stated that they were 18 years or older, and protocols were established through the Michigan State University Institutional Review Board, where the study was declared exempt (IRB# x03-651).

Research Design

The portfolio analysis addressed the following research questions:

1. Which competencies were most frequently addressed in the ePortfolios?
2. What sources of learning evidence did students utilize in their ePortfolios?
3. What kinds of evidence of learning did students submit in their ePortfolios?

The program director tracked each student submission using electronic review spreadsheets. Data included the target competency, whether the competency was required or in the student's plan, the source of evidence submitted for review, submission date, assessment date, pass/fail status of submission source of evidence, and program director feedback.

Measures

The program director assessed student achievement of competency tasks by utilizing rubrics based on the Critical Thinking Value Rubric produced and developed by the Association of American Colleges and Universities (2014; Rhodes, 2010b). The rubric utilized five criteria for assessing critical thinking in terms of suitable and sufficient evidence, explanation,

context and assumptions, student position, and conclusion. Students were required to meet the capstone level on each criterion to achieve successfully the competency learning task. The capstone rubric descriptors are as follows:

- Explanation: Issue/problem to be considered critically is stated clearly and described comprehensively, delivering all relevant information necessary for full understanding.
- Evidence: Information is taken from source(s) with enough interpretation/evaluation to develop a comprehensive analysis or synthesis. Viewpoints of experts are questioned thoroughly.
- Influence of context and assumptions: Thoroughly (systematically and methodically) analyzes own and others' assumptions and carefully evaluates the relevance of contexts when presenting a position.
- Student's position (perspective, thesis/hypothesis): Specific position (perspective, thesis/hypothesis) is imaginative, taking into account the complexities of an issue. Limits of position (perspective, thesis/hypothesis) are acknowledged. Others' points of view are synthesized within position (perspective, thesis/hypothesis).
- Conclusions and related outcomes (implications and consequences). Conclusions and related outcomes (consequences and implications) are logical and reflect student's informed evaluation and ability to place evidence and perspectives discussed in priority order.

Procedure

Students submitted portfolio evidence for each corresponding competency through an online course management system or an electronic portfolio platform. Students received a rubric score and feedback on each submission (Figure 1). Students were able to revise and resubmit until their submission met the capstone level for all five critical thinking criteria for each competency task they sought to achieve. Every submission was included regardless of whether the submission achieved a passing status.

Data were collected by reviewing and summarizing the portfolio review sheets for each student. Counts were made of the source of the evidence and the kind of evidence utilized. Categories of curricular sources of evidence included the three required program courses, a student's major field of study, elective courses, and study abroad. Non-curricular sources of evidence

emerged from participation in student organizations, work, community service, or career preparation materials such as resumes, cover letters, and graduate school applications. Because students could submit more than one piece of evidence for each competency or could use one piece of evidence to address multiple competencies, depending on the variable, data were analyzed either in terms of number or percent of individual student submissions, or in terms of the total number of submissions (regardless of student). This descriptive content-analysis study provides no statistical analysis and makes no claims of generalizability beyond the program.

Results

Research Question 1: Which Competencies Were Addressed Most Frequently in the ePortfolios?

As indicated in Table 1, students most frequently chose to submit more evidence for the highest levels of Ecological Integrity (7/13 students) and Civic Engagement (6/13) and were less likely to submit evidence for higher levels of Personal Awareness and Development (1/13) and Aesthetic Understanding (1/13). Very little variation occurred at the highest level among the process competencies (Personal Development, Critical Thinking, Civic Engagement, and Systems Thinking), with only Personal Development serving as an infrequent submission. However, submissions appeared more skewed among the content competencies (Social Equity, Economic Vitality, Ecological Integrity, and Aesthetic Understanding), with Ecological Integrity serving notably as a very high frequency submission at the highest level.

Research Question 2: What Sources of Learning Evidence Did Students Utilize in Their ePortfolios?

Of the 13 students completing the sustainability minor, students most often populated their portfolios with evidence from academic rather than non-academic sources (Tables 2 and 3). As indicated in Table 2, students most frequently utilized evidence from their ACR 487 Sustainability Portfolio Capstone class (13/13 students), ACR 387 sustainability practicum (12/13), other electives (11/13), or ACR 187 Introduction to Sustainability (9/13). An example of capstone coursework materials includes an analysis of the gender representation in a student's professional field that was inspired by an internship. Another student submitted a conceptual graphic from the student's practicum experience developing sustainable packaging materials at a corporation that described the balance needed between economic cost and environmental gain from developing more sustainable packaging systems. A minority of students (6/13) submitted evidence from their academic majors.

Figure 1
Example of Completed Rubric Score

Assessment:

	Benchmark 1	Milestone 2	Milestone 3	Capstone 4
Explanation of issues Value: 3.00	Issue/ problem to be considered critically is stated without clarification or description.	Issue/ problem to be considered critically is stated but description leaves some terms undefined, ambiguities unexplored, boundaries undetermined, and/ or backgrounds unknown.	Issue/ problem to be considered critically is stated, described, and clarified so that understanding is not seriously impeded by omissions.	Issue/ problem to be considered critically is stated clearly and described comprehensively, delivering all relevant information necessary for full understanding.
Evidence - Selecting and using information to investigate a point of view or conclusion Value: 3.00	Information is taken from source(s) without any interpretation/ evaluation. Viewpoints of experts are taken as fact, without question.	Information is taken from source(s) with some interpretation/ evaluation, but not enough to develop a coherent analysis or synthesis. Viewpoints of experts are taken as mostly fact, with little questioning.	Information is taken from source(s) with enough interpretation/ evaluation to develop a coherent analysis or synthesis. Viewpoints of experts are subject to questioning.	Information is taken from source(s) with enough interpretation/ evaluation to develop a comprehensive analysis or synthesis. Viewpoints of experts are questioned thoroughly.
Influence of context and assumptions Value: 3.00	Shows an emerging awareness of present assumptions (sometimes labels assertions as	Questions some assumptions. Identifies several relevant contexts when presenting a position. May be more aware of	Identifies own and others' assumptions and several relevant contexts when presenting a position.	Thoroughly (systematically and methodically) analyzes own and others' assumptions and carefully evaluates the relevance of contexts

Comment:

Good, but you need to provide some Evidence for each of the systems thinking competencies (4.4-4.7) in terms of how community gardens operate as depicted in your diagram are explained. So provide some evidence for pests, for irrigation as leverage, etc. Perhaps a web page or a reference is all you need.

Comments

Comments may be used to provide additional feedback and suggestions.

Table 1
Frequency of Students that Addressed Each Level (1-8) of Each Competency

Level	Personal	Critical	Civic	Systems	Social	Economic	Ecological	Aesthetic
1	13	11	12	13	13	10	12	13
2	12	13	12	12	12	12	11	13
3	12	12	12	11	8	10	13	7
4	11	12	11	12	6	1	8	8
5	12	12	13	12	5	2	8	1
6	1	4	6	4	2	3	8	1
7	1	4	6	3	2	2	7	--
8	--	--	--	--	--	1	--	--

Table 2
The Percentage (%) of Portfolio Submissions by Curricular Source for Each Student

Student	ACR 187	ACR 387	ACR 487	Major	Elective	Study abroad
1	0	10	24	5	59	0
2	21	0	29	18 ^a	13	0
3	0	79	21	0	0	0
4	30	22	9	0 ^a	36	2
5	12	15	36	0	22	15
6	13	4	53	7	7	2
7	0	40	36	0 ^a	8	0
8	0	24	58	3 ^a	15	0
9	5	49	17	15	5	5
10	6	40	8	0	33	0
11	58	27	4	0 ^a	11	0
12	20	18	2	7 ^a	41	0
13	5	59	23	0	0	0
#Students	9	12	13	6	11	4
Mean %	13	30	35	4	19	2

Note. ^aStudents shared at least one major.

Table 3
The Percentage (%) of Portfolio Submissions by Non-Curricular Source

Student	Student organization	Work	Service	Career prep
1	2	0	0	0
2 ^a	5	3	3	0
3	0	0	0	2
4 ^a	0	0	0	0
5	0	3	0	2
6	9	2	2	2
7 ^a	6	10	0	0
8 ^a	21	0	0	0
9	2	0	0	0
10	0	0	2	0
11 ^a	0	0	0	0
12 ^a	4	7	0	0
13	3	10	0	0
Students	8	6	3	3
Mean %	4	3	0.5	0.5

In terms of distribution across academic sources, six students (1, 3, 6, 8, 11, and 13) utilized one source that comprised at least 50% of the submissions (Table 2). Two students (2 and 5) displayed a more even distribution of portfolio sources, with no source exceeding 36%. The results display a large diversity in the distributional assemblage of sources across students. Two students drew mainly from the practicum course, ACR 387 Sustainability Practicum, and two students drew mainly from the capstone course. Every student drew upon ACR 487 Sustainability Portfolio Capstone, all but one drew from ACR 387 Sustainability Practicum, 11/13 utilized electives, while 9/13 used Introduction to Sustainability. Students 3 and 13 drew from no more than 3/7 possible curricular sources. Students 4, 5, and 12 drew from five sources, while students 6 and 9 drew from six academic sources. Only one student drew from study away, and that comprised 40% of that student's submissions (not included in table to protect student confidentiality).

The most common non-academic sources (Table 3) included student organization involvement (8/13 students) and work/internship experiences (6/13). For example, a student submitted the job description for executive officers as evidence of civic engagement competencies in terms of the leadership and facilitation roles and requirements of serving as a president of a student professional organization. Only student 6 (Table 3) drew from all four of the most common non-curricular sources, which leads to the greatest breadth among the portfolios. Student 2 drew upon three-quarters of the most common non-curricular sources. Students 4 and 11 used none of the most common non-curricular sources. Student 8 drew heavily (21%) from student organization experience. In terms of less frequent non-curricular submissions, one student used 6% from graduate school application essays. Another student drew 5% from professional conference participation. Overall, students 2, 5, and 6 had the most diverse portfolios, either in terms of breadth and/or in terms of equal distribution of sources.

Research Question 3: What Kinds of Learning Evidence Did Students Submit in Their ePortfolios?

Students most often submitted written manifestations of competency learning that were mostly associated with existing academic formats, such as formal papers, lab reports, and homework assignments. Some of the formal academic evidence included such non-traditional (depending on major) formats as maps, geographic information systems analysis, and student journals. One student provided required class videos used to document public speaking ability over time, along with a corresponding reflection about improvement. One student also provided a class video

project produced for a foreign language class. Students also submitted PowerPoint presentations and photographs.

The greatest range and diversity of evidence emerged from the ACR 387 Sustainability Practicum class. Student output included a life-sized sculpture made of materials drawn from the campus surplus and recycling center, elementary school art and posters depicting students' visions of sustainability, several business plans, websites, curricula, statistical output/reports, focus group summaries, and management recommendations. For more advanced competency tasks, one student submitted software programs developed to track greenhouse gas emissions for a pharmaceutical company internship (Systems Thinking-7: Diagnose a problem, create an intervention/alternative system to address the problem; or, delineate alternative initial conditions that could lead toward a more sustainable state; and Ecological Integrity-7: Propose a plan to address the roles of an actual threat to ecological integrity). Another student developed a business plan for a company to track consumer carbon footprint and use the fees to fund local carbon mitigation efforts (Economic Vitality-8: Develop a plan to address a specific sustainability issue that demonstrates multiple perspectives of economic vitality and how they affect resource allocation).

Beyond traditional course assignments, students have submitted other non-formal learning artifacts. One student from the marching band submitted two videos of band performances, contrasting the aesthetic attributes of two different bands (Aesthetic Understanding-1: Describe some common indicators of aesthetic quality). Another student submitted a video of diversity awareness training conducted while serving as a mentor in the residence halls (Personal Development-1: Describe ones self, identity(ies), values, and worldview; and Social Equity-1: Identify and describe key examples of how individuals and social groups experience inequality). Another student submitted photos and a journal of international travel conditions compiled while on vacation (Personal Development-7: Synthesize personal experiences, values, and thinking with external opinions and evidence into a coherent statement related to current and envisioned goals for one's sustainability journey.)

Discussion

The results represent an attempt at addressing the goals of the U.N. Decade of Education for Sustainable Development in terms of (a) monitoring and evaluation, (b) encouraging a research agenda and serving as a forum for relevant research on ESD, and (c) sharing good ESD practices (United Nations Education Science and Cultural Organization, 2014). The study also

addresses research needs by describing how sustainability is implanted in the curriculum and how, and under what circumstances, students develop the necessary capabilities to contribute to a more sustainable future (Barth & Thomas, 2012).

Research Question 1: Which Competencies Were Addressed Most Frequently in the ePortfolios?

Expected results. The frequent submission of portfolio evidence for Ecological Integrity and Civic Engagement (Table 1) reflects common understandings and manifestation of sustainability in the public sphere, as well as in sustainability education (Karlin et al., 2013). Unfortunately, sustainability has come to mean the narrow equivalent of environmental or green practices. What is surprising is that Ecological Integrity is not stressed in the introductory class as much as Systems Thinking and Civic Engagement. Furthermore, the core rubric for every portfolio submission requires students to address Critical Thinking, as articulated by the Association of American Colleges and Universities. This might provide an example of the powerful role of incoming student assumptions and how those assumptions affect student learning (Bransford, Brown, & Cocking, 2000). Despite the multidimensional, eight competency design, students might still cling to the primacy of the ecological domain that they displayed upon entering the program (Karlin et al., 2013).

A possible curricular explanation for the frequency of Ecological Integrity is that the majority of students (8/13) pursued majors within the College of Agriculture and Natural Resources, although only one pursued an explicitly environmental major, with most pursuing Packaging. Students in other colleges pursued environmentally related majors, including Earth Science or Geography, while the remainder pursued business or psychology. Given that ten students hold majors in Packaging or business-related fields and will work in the corporate arena, one would expect that more than one student would have pursued advanced levels of Economic Vitality (Table 1). Perhaps that reflects the lack of attention given to the economic, financial, or business aspects of sustainability in students' curricula outside of the sustainability program.

The focus on Civic Engagement makes sense, given the great effort made to develop campus-based civic engagement projects in the introductory course, as well as the frequent environmental activism of students and affiliated student organizations. Furthermore, many students chose to submit evidence from the practicum course, which frequently involves working with partners through internships, either on or off-campus.

As expected, students gave less attention to Aesthetic Understanding, reflecting the lesser degree of

emphasis on this area in sustainability education (e.g., see the June 2013 special issue of *Sustainability: The Journal of Record* at <http://online.liebertpub.com/toc/sus/6/3>). This is exacerbated by the inattention given to the arts within the students' majors, despite a university requirement that students earn two courses in Integrated Arts and Humanities.

Unexpected results. Lack of attention to advanced Personal Development competencies is somewhat surprising, given the personal nature of electronic portfolios and claim of advocates that "e-portfolios can be used to support student success, intellectual growth, and individual development within higher education and beyond" (Chen & Light, 2010, p. 1). So while ePortfolios might foster personal development overall (Richards-Schuster et al., 2014), students failed to pursue more advanced level personal development competencies as part of their portfolios. While the program was built around enabling students to demonstrate both the delivered and the experienced curriculum (Chen & Penny Light, 2010; Yancey, 1998) or the hidden curriculum (Winter & Cotton, 2012), students more often drew upon the standard delivered curriculum. This also reflects the reduced priority given to explicit Personal Development competencies in the introductory course. So while students may end up gaining intermediate level aspects of Personal Development by the nature of the pedagogy of the program, they more frequently identify advanced levels of other process competencies (Critical Thinking, Civic Engagement, or Systems Thinking) as components of their sustainability portfolios.

Research Question 2: What Sources of Learning Evidence Did Students Utilize in Their ePortfolios?

Expected results. Students did provide a range of portfolio evidence, though sources from formal academic, credit-bearing experiences dominated the portfolios. Little overlap in sources of evidence (Tables 2 and 3) among the portfolios indicates that students selected a range of portfolio sources to meet the same competency expectations. This holds true even with the six students that shared a similar major. The diversity in approaches meets program design expectations built around the learning paradigm (Barr & Tagg, 1995; Tagg, 2003) and learner-centered education (Blumberg, 2009; Blumberg & Pontiggia, 2011; Mostrom & Blumberg, 2012; Weimer, 2002). Students displayed choice in both the range of competencies they chose and the range of evidence they chose to meet the competency. This echoes calls in the ePortfolio community to ensure a good balance between program structure and student flexibility and choice (Richards-Schuster et al., 2014).

Unexpected results. However, some of the patterns yielded surprises. Despite the predominance of students in sustainability-related majors, a minority of students submitted evidence from their major, as compared to elective courses (Table 2). This provides support for the idea that the program, sustainability itself, and the portfolio process (Peet et al., 2011) contribute to both integrative learning and liberal learning. The competencies provided an opportunity for students to apply learning from electives in a coherent, logical fashion. Some of the electives related to major fields of study, while others related to the MSU liberal learning design requiring credits in integrative studies in arts and humanities, biological or physical science, and social science. The lack of use of major coursework perhaps represents the lack of major tie to, or emphasis on, sustainability. However, that is surprising, given the kinds of majors, such as Environmental Studies and Agriscience, Geography and Packaging, the latter of which focuses heavily on concepts such as life-cycle assessment and recycling.

The lack of study abroad proves surprising, given the campus's emphasis on and data about student participation in study abroad. Michigan State University displays a long history of international engagement and, for the last six years, has led the nation in study-abroad participation among public universities. It runs over 275 programs, across 60 countries, involving close to 3,000 students each year (Michigan State University, 2014b). Only a minority of students (4/13) submitted study-abroad evidence, and only one used such evidence for more than 10% of the portfolio. One would expect a higher use of study-abroad material in conjunction with competencies such as Personal Development, Critical Thinking, and Social Equity, as these represent frequent hallmarks of the rationale for study abroad.

At Michigan State University, student registrations for community service opportunities reached 17,892 in 2010-2011 and 18,889 in 2011-2012 (Michigan State University, 2012). Despite those figures, however, only three students submitted service experiences, and those comprised a very small portion (2-3%) of the overall portfolio materials (Table 3). The lack of service experiences represents an overall lack of non-curricular sources of evidence, despite the strengths of a portfolio in valuing non-academic experiences and learning (Chen & Penny Light, 2010) and the program's emphasis on and recognition of the critical importance of learning in community (Bransford et al., 2000). Students in the program receive advising that emphasizes how courses provide only a subset of the possible learning spaces in their portfolios. Adding to the surprise, the program includes two competencies, Personal Development/Awareness and Civic Engagement, in which non-curricular opportunities

might provide the best and richest learning opportunities, especially in terms of leadership (Missimer & Connell, 2012). The program design and choice of competencies reflects a programmatic value on whole-person development that aims to facilitate student journeys toward self-authorship (Bekken & Marie, 2007; King & Baxter Magolda, 2005), in which students are comfortable making their own meaning of concepts situated within a larger whole and recognize a range of other understandings and meanings. Part of the explanation might lie in the application of typically non-curricular kinds of civic engagement experiences in the practicum class.

Research Question 3. What Kinds of Learning Evidence Did Students Submit in Their ePortfolios?

Expected results. While advocates of ePortfolios identify them as conducive to review of multiple forms of evidence (Chen & Penny Light, 2010), the sustainability minor portfolios displayed a mixed set of results. While a range of evidence certainly exists, students most often relied on written textual materials, either derived from traditional academic assignments or summarizing non-academic experiences. This certainly represents the path of least resistance, as one would expect students to have the greatest experience and comfort in submitting traditional written assignments. It also reflects perhaps the standard assignments requested by faculty teaching students in traditional classes.

Unexpected results. Interestingly, while the Introduction to Sustainability course utilizes a range of assignments and evidence modalities, a minority of students (6/13) utilized a substantial amount (>10%) of evidence from that course. One would expect a range of evidence types because of both the nature of the formal program design and also of the students' multiple intelligences (Gardner, 1983, 2006). The concept of multiple intelligences suggests that individuals may have varying ranges for the kinds of learning domains, including: verbal-linguistic, bodily-kinesthetic, interpersonal, intrapersonal, naturalistic, spatio-visual, musical-rhythmic, and logical-mathematical (Gardner, 1983, 2006). A lesson for the program is to highlight such different forms of evidence with existing students so that they can see what is possible and acceptable.

Education for Sustainability

The portfolio evidence reflects the calls for applied project work to convey sustainability learning (Barth & Michelesen, 2013; Brundiers & Wiek, 2011; Karlin et al., 2013; Sterling, 2010; Stupans, Scutter, & Pearce, 2010; Thomas, 2009). Students drew from projects in ACR 187 Introduction to Sustainability, ACR 387 Sustainability Practicum and work/internships, and

student organization activity. Students often drew upon their practicum course (Table 2), which reflects an emphasis on the applied, project-based kind of learning that is considered critical for sustainability learning. Students also focused on competencies related to civic engagement (Table 1), which also satisfies much of the discourse surrounding education for sustainability (Anderberg et al., 2009; Barth & Michelesen, 2013; HEPS, 2004; Mochizuki & Zinaida Fadeeva, 2010). Most important, the results describe one of the few assessments and descriptions of a learner-centric approach to sustainability education that several scholars have identified as a need (Glover et al., 2012; HEPS, 2004; McKeown, 2011; Yousey-Elsener et al., 2010). The results further utilize portfolios to assess applied-project performance related to competencies commonly identified as crucial for effective sustainability education.

Portfolio Program Assessment

The portfolio assessment identified student approaches to providing evidence of “knowing what, how, why and when” (Shavelson & Huang, 2003). However, the review also identified gaps and needs. While portfolios enable students to provide a range of evidence (Chen & Penny Light, 2010), a majority of the evidence was derived from curricular activity (electives and core courses), and a minority of students utilized curricular material from their major coursework. The results support the claims that “electronic student portfolios recognize that learning occurs in many places, takes many forms, and is exhibited through many modes of representation” (Rhodes, 2010a, p. vi). The student portfolios also illustrate the application of the learning paradigm (Barr & Tagg, 1995; Tagg, 2003) and learner-centered education (Blumberg, 2009; Blumberg & Pontiggia, 2011; Mostrom & Blumberg, 2012; Weimer, 2002), as displayed in the distribution of portfolio evidence by students (Tables 1 through 3). Students used a variety of evidence, though not all students used the same range of sources for evidence.

Portfolios provide the kind of platform to facilitate integrative learning (Chen & Penny Light, 2010; Peet et al., 2011; Richards-Schuster et al., 2014) that educational scholars advocate for helping students make sense of their overall educational experiences (Bekken & Marie, 2007; Bransford et al., 2000; Haynes et al., 2010; King & Baxter Magolda, 2005). However, results indicate that adopting a more formal approach might yield more robust portfolios, as students often struggle with integrative learning (Peet et al., 2011). This struggle occurs despite the fact that Michigan State

University requires a sequence of integrative learning within the areas of Arts and Humanities, Social Science, and Biological and Physical Sciences. While those courses might encourage integration within related fields, they may not facilitate a more focused attention on integrated learning itself that would enable students to better integrate common outcomes across a range of courses and experiences, both in and out of the classroom, as well as across a range of modalities.

Limitations

While analyzing every artifact and source for every student portfolio provides a level of depth and rigor, the participation of only 13 students prevents the use of statistical analysis and generalization of findings beyond the scope of the program. Only one person (the program director and author) analyzed ePortfolio contents, which could threaten validity in terms of categorization of the kinds of artifacts students submitted.

Conclusions

Given the need to design, test, document, assess, and improve the knowledge and performance of education for sustainability programs (Barth & Thomas, 2012), as presented in the U.N. Decade of Education for Sustainable Development, this study demonstrates how electronic portfolios enable students to provide a range of evidence to demonstrate their sustainability learning. This approach reflects the learning paradigm (Barr & Tagg, 1995; Tagg, 2003) by focusing on student learning regardless of modality (source or type of learning evidence). It also fits the learning-centered approach (Blumberg, 2009; Blumberg & Pontiggia, 2011; Mostrom & Blumberg, 2012; Weimer, 2002) by enabling student choice and reflection. While students successfully submit evidence, however, they often find themselves starting and completing the portfolio in their final 15-week term. That delay runs counter to the design of effective portfolio-based education (Chen & Penny Light, 2010) in that students have difficulty demonstrating the range of their learning. The delay in commencing their portfolios prevents students from effectively building and scaffolding learning as they proceed, instead of having to make such connections retrospectively. Richards-Schuster et al. (2014) reach a similar conclusion regarding using ePortfolios for their interdisciplinary minor. Hopefully, this study provides the impetus for other sustainability programs to embark on ePortfolio use.

Postscript

Unfortunately, after two years of implementation the sustainability minor program was eliminated in fall 2013

due to concerns with low enrollment. The unique and divergent emphasis on competency-based performance and ePortfolios beyond the typical courses and credits approach seemed to deter both student enrollment and the willingness of faculty and staff, beyond the program director, to review portfolios and apply rubrics. This may reflect the large range of other voluntary and required curricular options available that reflect a more standard approach to higher education and sustainability learning. While the program arose during an institutional reform initiative called Boldness by Design, perhaps the program design proved too bold for its own good. As others have learned, embarking on ePortfolio efforts provides enough challenge for institutional adoption.

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Teaching vs. Research: An Approach to Understanding Graduate Students' Roles through ePortfolio Reflection

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In this work, we examined the problem of preparing future faculty (graduate students) regarding their development in multiple roles, focusing on students in science and engineering disciplines. The purpose of the presented research was to address the questions, "Do graduate students believe that their current experiences align with the roles they will perform in their academic careers?" and "How do graduate students' perceptions of their professional roles change during the process of constructing portfolios?" We used the theoretical lens of role identity to guide this work; academic careers are typically categorized in terms of teaching, research, and service, which can be mapped as professional identity roles. We conducted a survey and focus groups with participants working through an ePortfolio development curriculum. Our findings suggest that there is a perception of misalignment between current and future roles, and that the construction of ePortfolios can be utilized to promote reflective practices leading to changed perceptions of those roles.

Graduate students are required to balance a variety of roles while completing their education and preparing for their careers (Cast, 2003; Sweitzer, 2009). Further complicating this phase, the graduate years are a transitional time that is critical to constructing professional identities and personal development. However, it is not clear how well students are able to balance their roles or how well graduate programs support the development of different roles, especially in the transition from PhD experiences to professional roles in academia. Our goal is to answer the following research questions about this critical phase in student development:

1. Do graduate students believe that their current experiences align with the roles they will perform in their academic careers?
2. How do graduate students' perceptions of their professional roles change during the process of constructing portfolios?

In order to address these research questions, a previously developed survey (Kajfez & McNair, 2014) was distributed and analyzed to measure student perceptions of professional role identities in academia. Grounded in role identity theory, the survey elicits students' perceptions of their current roles in academia and the future roles they believe they will have after graduation. After taking the survey, the students participated in an ePortfolio experience in which they specifically explored their various roles and then shared their impressions in a focus group. The results of the survey and the focus groups allow for an examination of graduate student development to better understand these formative experiences.

Literature Review

The theoretical concept of role identity stems from a combination of social and identity theory, in which

"who you are is derived from social memberships" (Ashforth, 2001, p. 26). Such relational identities, which are based on both an individual's personal and social selves, "are role-based personas complete with goals, values, beliefs, norms, interaction styles, and time horizons" (Ashforth, 2001, p. 51). When a role is adopted, salient characteristics of that role (as instituted by social groups and perceived by individuals) are also incorporated to inform the sense of self, including one's sense of belonging in professional organizations (Whetten & Godfrey, 1998). Thus, role identities are reflexive in nature. Enacting a role does not necessarily require accepting that identity as self-defining; however, the navigation and transition between roles does involve an adjustment of personas and sometimes involves internalizing an altered self-concept.

Academia as an organization provides a hierarchical role structure that requires members (especially faculty) to construct their profession from a variety of roles (e.g., researcher, teacher, advisor, administrator). In graduate school, students work in a transitional state where they are experimenting with a variety of these identities, roles, and behaviors (Colbeck, 2008). This preparation for academia can require daily role transitions that are critical but poorly understood (Denecke, Kent, & Wiener, 2011). As students navigate possible roles, they start to "articulate a narrative thread that connects possibly disparate experiences into a coherent story about themselves" (Ashforth, 2001, p. 8). Digital portfolios or *ePortfolios* are tools that can help students shift from this implicit mode of development to an explicit process of self-understanding through the reflective practice of creating a shared representation of one's professional self. The ePortfolio curriculum we have developed, for example, is designed to help graduate students and their advisors curate professional trajectories (McNair & Garrison, 2012, 2013a). Our work also aims to better understand

these transitions to ensure that we are properly preparing graduate students for their futures.

We recognize that many graduate students are preparing for future roles outside of academia that will require a unique level of preparation. The present work is situated within the mission of the Preparing Future Faculty (PFF) program, which has noted a trend of discontinuity between the PhD experiences and the professional culture of academia (de Weert, 2009; DeNeef, 2002; Gaff, Pruitt-Logan, Weibl, & Participants in the Preparing Future Faculty Program, 2000; Golde & Dore, 2001). In the future, we hope to examine trajectories beyond the academic career path; however, at this time those additional paths are beyond the scope of this work. Additionally, within science and engineering disciplines, which place emphasis on research in both student and faculty roles, there is a unique balance that needs to be explored, so we focus this work on the roles of researcher and teacher to begin this examination (Kajfez & McNair, 2014; McNair & Garrison, 2012).

Graduate Students as Researchers and Teachers

Identity has been explored in a plethora of ways. The notion of identity as a human development concept was proposed by Erikson: "Identity helps one to make sense of, and to find one's place in, an almost limitless world with a vast set of possibilities" (Schwartz, 2005, p. 294). Researchers in the fields of psychology and sociology have since built on Erikson's work through research projects and theory generation (e.g., Marcia, Waterman, Matteson, Archer, & Orlofsky, 1993). Despite this growth, there are still gaps in the literature related to the use of identity concepts in science and engineering fields. Most of the research regarding identity in these areas focuses on the identity of undergraduate students (Beam, Pierrakos, Constantz, Johri, & Anderson, 2009; France, Pierrakos, Russell, & Anderson, 2010; Matusovich, Streveler, & Miller, 2010; Nicholls et al., 2007; Tate & Linn, 2005). There has been little examination of the construct regarding graduate students in engineering and science. Our research aims to fill that gap.

To frame our work, we have specifically chosen to view graduate student identity through the researcher and teacher roles. We recognize that graduate students may have additional roles beyond these two (e.g., student, parent, spouse) and that academic professions involve roles in service and lifelong learning. However, teaching and research roles are the most salient demands on academics and often are the two that are the most at odds. For example, Aydeniz and Hodge (2011) studied the development of teacher identity through a case study focused on a professor in biology. They directly observed the tension between teaching

and research, using Sfard and Prusak's (2005) view of identity, in which they "equate identity with the stories that individuals tell, in this case, about their teaching and the expectations that they must meet in order to be successful as professionals" (Aydeniz & Hodge, 2011, p. 168). Through an interview and observations with the professor, they learned that a professor's role is often composed of both a researcher and a teacher component, where the researcher identity often overshadowed the teacher identity due to institutional circumstances and expectations impacting the participant's career trajectory. Accounts such as this support the need to start with an examination of researcher and teacher roles within graduate students.

Much of graduate school, especially in engineering, is related to developing students into researchers. Despite this focus, there is little systematic research about this process and how to accomplish it effectively as a student or how to support students through this process as an advisor. Similarly, there is even less work that examines the alignment between graduate experience and post-graduation careers. Regardless of the lack of information, there are a few examples of research that we can build on to support our work regarding the researcher role. The first is an article by Crede and Borrego (2012) that studied research groups as a key element to graduate development in engineering. Through ethnography-based observations and interviews that led to a survey, they determined that research group size and advising directly influence student learning and professional development. With this in mind, it is essential to consider interactions in these types of environments when exploring graduate student roles. Harrison (2008) also explored graduate student researcher identity development, focusing on the field of counseling through an examination of his own personal development. He, too, found that the student-supervisor relationship, or advising, is highly impactful, again indicating that interactions with others directly influence development and growth.

Much of the current literature about graduate students in teaching roles in engineering is focused on graduate teaching assistant (GTA) development programs or GTA evaluations and assessments (e.g., Cox et al., 2011; Matusovich, Lee, Janeski, & Winters, 2011). While these articles are important to the engineering landscape, they tell us little about graduate students' experiences teaching across institutions or about graduate student teacher development. Outside of engineering, Olsen (2008) examined the transition from student to teacher in an English department. His work reveals that novice teachers often reach back to past experiences to identify with their new teacher role. This reliance on models may, however, be problematic. For example, Brownell and Tanner (2012) argued that

pedagogical changes currently needed in education may be impeded if instructors model their approaches on the traditional methods of their own teachers. Jarvis-Selinger, Pratt, and Collins (2010) examined the transition from pre-service teacher to practicing teacher, focusing on participants' levels of commitment to teaching. Exploring perceptions and expectations, they report that discussions of the transition assist teachers' development and recognition of their new roles. While they are outside of engineering as a field, these studies point to ways to ease the developmental transition from student to teacher.

To truly understand the graduate student to academic transition, these roles within the researcher and teacher identities must be studied in parallel. Our work aims to do that, while also considering current and future perspectives.

Impacts of Reflective Practice via Digital Portfolio Construction

As readers will recognize, an ePortfolio can be defined simply as a collective digital storage space of a person's work artifacts providing authentic, valid, and reliable evidence (Carroll, Calvo, & Markauskaite, 2006) that is constructed in a non-random, purposeful manner and provides reflections to emphasize knowledge, competencies, and/or skill sets possessed by the creator (Paulson, Paulson, & Meyer, 1991). By engaging in the process of collecting, categorizing, and reflecting on artifacts, the creator establishes a "digital identity or persona" (Clark, 2010, p. 29). In educational settings, many researchers and practitioners agree that students should include work that has been collected, selected, and reflected on by the student, which helps the author of the ePortfolio feel ownership of their product (Cole, Ryan, & Kick, 1995).

These fundamental affordances have been explored further in terms of professional preparedness through integrative thinking and identity construction. Integrative thinking is a synthesis of different elements that results in a creative, holistic combination that is greater than the sum of its parts; in this research, the influence of different graduate student roles is a reflection of integrative thinking (McNair & Garrison, 2013b).

As an educational goal, integrative thinking focuses on the ability to manage complexity and problem solving, and thus helps students make connections between ideas and experience to prepare for non-uniform professional roles (American Association of Colleges and Universities [AAC&U], 2012). Integrative thinking has been developed as an affordance of ePortfolios at the University of Michigan by Melissa Peet, who has built on the AAC&U's work to establish six dimensions of integrative learning as a

foundation for a conceptual model informing her portfolio process, Integrative Knowledge Portfolio Process (IKPP). The IKPP was established "in order to create a pedagogy and technology to help students know and articulate what they have learned at UM" (Peet, 2011, p. 12), particularly in terms of how their learning was valuable to them and how they would apply it in their careers.

Closely related to these goals is the work of Turns and her team, who have explored and developed portfolio studios for undergraduate engineering students and observed patterns of self-authorship and professional identity construction (Kilgore, Sattler, & Turns, 2013; Sattler & Turns, 2015). In these settings, students develop as self-authoring individuals while navigating their learning development and, furthermore, are able to make connections between experiential and academic learning, resulting in heightened awareness and preparation for their professions.

Methods

This study addresses the following research questions by employing data collected from a survey and focus groups. The survey was informed by role identity theory, and the focus groups were conducted at each institution after students completed ePortfolios:

1. Do graduate students believe that their current experiences align with the roles they will perform in their academic careers?
2. How do graduate students' perceptions of their current and future roles change during the process of constructing portfolios?

ePortfolio as Intervention in Graduate Student Professional Development

We used the P2P ePortfolio curriculum (McNair & Garrison, 2013a) in this study to guide students in constructing professional online portfolios. This program followed the guidelines for integrative and applied learning as one of the essential learning outcomes set forth by the AAC&U and also considered the context of graduate school, focusing on engineering and science students pursuing academic goals that include both research and teaching. By asking students to include components of teaching, research, and other academic themes in their ePortfolios, we considered not only cross-curricular and cross-contextual integrations but also the ability to manage multiple and sometimes conflicting role identities.

Specifically, the P2P program encouraged reflective practice in graduate students as they constructed professional identities as both researchers and teachers. We developed the process and assessment

protocol to guide students through building a portfolio and to encourage their development through integrative thinking. The curriculum divides the process of creating a professional ePortfolio into weekly tasks that students can complete through self-paced or externally structured settings. A fundamental part of the process is feedback provided by both peers and faculty.

As they created a professional portfolio, students were asked to upload evidence of and write narratives about their accomplishments in distinct categories, such as research and teaching, as well as other components of the careers they were preparing for. Each piece of evidence that students uploaded typically documented a specific professional accomplishment. Students were then asked to write narratives to pair with their uploaded evidence. These narratives not only provided helpful background on the circumstances of the accomplishment but also spoke to what the students learned through the process. Finally, students were asked to reflect on their pages and write *meta-narratives* to provide readers with holistic views of themselves as professionals. Through these assignments, we endeavored to engage students in integrative and reflective practices of self-assessment that encourage “dialectical thinking, metaphorical thinking, building a metalanguage, and developing common ground” (Seabury, 2002, p. 51).

As discussed above, researchers have taken different approaches to exploring graduate student identity, integrative thinking, and reflective practice. Our research supplements these past studies through a quantitative and qualitative examination of graduate student identity, in which we purposefully focus on the roles of teacher and researcher. To further define our perspective, we explored graduate students' perceptions of these roles today and in the future. Specifically, we examined (1) the actual roles they hold as current graduate students; (2) the roles they desire to hold as graduate students and in their future careers; and (3) the roles they believe they are expected to hold as current graduate students and in their future careers. The survey we developed (described in the next section) provided a quantitative measure of these dimensions. Furthermore, we believe that building professional portfolios is a useful reflective practice that may facilitate integrative thinking and help graduate students construct balanced professional identities as future faculty. We explored student experiences in this regard through qualitative data gathered in focus groups and driven by questions about the impact of reflective practice on professional identity through ePortfolio construction. By exploring professional

roles in these ways, we are able to understand better the nuances among actual, desired, and expected roles both today and in graduate students' future careers.

Participants and Settings

Our study participants were science and engineering graduate students at four R1 institutions who volunteered to complete a survey and participate in focus groups while working through the P2P ePortfolio curriculum. The focus on science and engineering graduate students is due to the need to develop critical teaching and learning skills that will impact faculty careers (Jamison & Lohmann, 2009), which conflicts with how doctoral programs emphasize research, especially in science and engineering programs (Borrego, 2007; National Science Board, 2007). Across the institutions, a variety of science and engineering disciplines were represented by a total of 47 individuals in the participant pool, with the greatest disciplinary variation occurring at Site #3. Although we did not perform any analysis based on the gender or age of the participants, we did collect this information in order to illustrate what our participants in this study were like. The participants were evenly split between female ($n = 23$) and male ($n = 24$) graduate students, while the majority of participants (59.6%) were in the 26-30 age range.

The P2P portfolio curriculum was used at all four schools, including the same online curriculum, assessment rubrics, and expert feedback. However, the circumstances of implementation and motivation differed between schools. As shown in Table 1, differences included duration, compensation, course credit, and setting. Demographic data revealed no major differences between settings, and ethnic identity information was not collected due to IRB concerns about indirect identification, due to low numbers of underrepresented populations.

The implementation efforts were coordinated by local personnel at all sites with support from P2P staff, with three implementations taking place in university-wide, teaching focused, professional development programs and one taking place in a department-required teaching practicum course. One cohort of students was paid, and one cohort received course credit for participation, while others received no compensation. Students were encouraged to select their own portfolio platforms, and they used a variety of technologies to construct their portfolios, ranging from a rudimentary open source course management tool, to public tools such as Google and WordPress, to commercial platforms such as Digication.

Table 1
Participants' School Descriptions

	Duration	Stipend	Course credit	No. of Participants	Implementation
School 1	One term	No	Yes	10	Portfolio required, all participants in a teaching practicum course that awarded 20% of course grade for completing portfolio according to a rubric standard
School 2	One term	No	No	12	Portfolio voluntary, all participants part of teaching practicum course, mixed science and engineering disciplines, majority engineering
School 3	One term	No	No	14	Portfolio voluntary, two in-person portfolio program meetings, mixed science and engineering disciplines
School 4	Two terms	Yes	No	11	Portfolio voluntary, two in-person portfolio program meetings, mixed science and engineering disciplines, majority engineering

Survey Instrument Development

In a separate study employing multiple experts and a pilot study with individuals outside of the population, the authors (Kajfez & McNair, 2014; Louis & McNair, 2011) developed a survey to measure graduate students' belief conditions about their preparation for the professoriate. The survey was tested for validity and reliability using an iterative process that involved expert review of the questions and constructs, piloting the survey with a large cross-disciplinary population, revising the survey questions, then piloting once again with a new population. The entire survey design process helped to ensure reliability and content validity. All of the 60 items were Likert-type scale responses with seven choices (1 = *strongly disagree*, 2 = *disagree*, 3 = *somewhat disagree*, 4 = *neutral*, 5 = *somewhat agree*, 6 = *agree*, 7 = *strongly agree*); the seven-point scale was chosen so that higher reliability could be obtained while allowing for more variability in individual responses. The final survey took approximately 20 minutes to complete and measured student responses on five belief conditions (current actual role, current desired role, current expected role, future desired role, and future expected role) and three identities (researcher, teacher, lifelong learner) for a total of 15 dimensions. Due to the emphasis in science and engineering fields on core roles, the data analyzed here only includes results from the responses relating to teacher and researcher identities. For a copy of the survey questions, please contact the authors.

Belief conditions are a person's perceptions of their role identities from different perspectives. For example, students were asked about their roles as researchers in terms of both their present situation and future career. The belief conditions measured five perspectives, asking participants to situate themselves in both their

current roles and their potential future roles, and in terms of their current actual experience, experience they desire currently and in future roles, and experience that they perceive is or will be expected of them (see Table 2).

The ultimate goal was to compare differences and similarities between items to uncover disparities between graduate students' perceptions of what they are currently doing and what they expect to be doing in their future professions.

Data Collection

We collected quantitative survey data to measure the alignment of student perceptions with their roles in graduate school and their future careers. In order to interpret these results and to explore the impact of ePortfolio work on professional identity, we also conducted focus groups. By collecting both quantitative and qualitative data, we were able to explore our findings looking for both breadth and depth.

Survey data collection. The survey was distributed via email to participants at the four sites who participated in a course that employed the P2P curriculum (approximately 90 total students, with a strong response rate of approximately 50%). The data collection period lasted four weeks. The survey was completed by participants prior to starting the P2P program in order to obtain a baseline measurement of students' perceptions of their professional identity roles at their institutions.

Focus group data collection. Focus groups were conducted in-person at each institution by the same trained moderator, using the same semi-structured format based on the roles students explored while constructing their ePortfolios (for a copy of the focus group protocol, please contact the authors). Each focus

Table 2
Teacher and Researcher Belief Conditions

Condition	Description
Current Expected	How students perceive others' expectations of their current roles (e.g., teachers, advisors, administrators); external requirements
Current Desired	How students want to inhabit the roles (can conflict with expected)
Current Actual	How students perceive their actual work within the roles (what they are actually doing)
Future Expected	How students perceive they will be expected to fill their roles by others in their future work environment (e.g., teachers, advisors, administrators)
Future Desired	How students want to inhabit the roles in their future work environment (can conflict with expected)

group consisted of six to 12 students and lasted for 60-80 minutes. The sessions were audio-recorded, and the researcher took field notes.

Data Analysis

Survey data analysis. The survey analysis followed six steps designed to discover patterns between teacher and researcher roles at the four sites.

In Step 1, we analyzed the entire set of student data to find an overall mean for each belief condition for each role identity. The survey contained 15 survey questions that focused on teacher identity and 15 that focused on researcher identity. There were three questions on each belief condition within each role. The results of the three questions that constitute each belief condition were averaged to find an overall mean value for each individual institution.

In Step 2, the means for each school were plotted on radial figures to enable a visual inspection of students' perceptions of teacher and researcher identity role alignment. Each school was plotted on a radial figure; one was for teacher identity roles, and one was for researcher identity roles.

During Step 3, the teacher and researcher figures were then visually inspected to determine differences between schools and between current and future perceptions within each school.

Next, in Step 4, we confirmed our visual findings through an ANOVA test in order to determine whether or not there were statistically significant differences between schools within certain belief conditions for each identity role.

For Step 5, we performed a set of two-tailed t tests ($\alpha = 0.05$) to determine the belief conditions that had statistically significant differences between current and future perceptions at each school. The null hypothesis for each of these tests was that the participants at the schools did not differ in their perceptions of their current and future work.

Finally, in Step 6, once we determined that there were statistically significant differences between

schools within the teacher role, we performed a set of two-tailed t tests (with $\alpha = 0.05$) to determine which institutions were different in which belief conditions. The null hypothesis for each of these tests was that participants in each school did not differ in their perceptions of the belief condition in question.

Focus Group Analysis

Focus group sessions were transcribed by the authors and qualitatively coded by topic categories that were informed by our underlying research questions. Specifically, we looked for patterns of responses regarding professional identity roles categorized by themes addressed in the students' ePortfolio projects (i.e., research, teaching, service, and lifelong learning). Our first step was to organize the discussions by topic; we then developed subdivisions according to patterns in and across each topic discussion. At this point, we checked the level of pattern grouping with an outside researcher, and then finally wrote out themes and iteratively revised this level of meaning among the three members of the research team.

Results and Discussion

The results of the survey and focus group discussions are explained below. The quantitative results indicate a misalignment between graduate students' perceptions of their current preparation and their future careers. The misalignment is further reflected by focus group discussions about the difficulties posed when creating integrative narratives.

Survey Results: Differences Between Schools and Between Researcher and Teacher Role Identities

Teacher and researcher identity roles. The mean results of the survey were best illustrated as radial figures that highlight balance as alignment (Figure 1): the researcher identity (top radial) was visually more balanced between students' current belief conditions

Figure 1
Researcher and Teacher Identity Visualizations



and what they perceive will happen in their future workplace as academics. On the other hand, the teacher identity (bottom radial) was visually unbalanced, showing misalignment between the current perceptions and future-focused desires and expectations.

As we theorized from visual inspection of Figure 1, there were no statistically significant differences between researcher group means, as determined by one-way ANOVA, $F(4, 15) = 3.023, p = 0.052$. However, the teacher group means resulted in statistically

significant differences, as determined by one-way ANOVA, $F(4, 15) = 14.387, p > 0.001$. Table 3 shows the statistically significant differences between schools within different belief conditions.

The results of the t test indicated the cases where the null hypothesis that the participants at both schools had the same perceptions of that belief condition should be rejected. All of the results listed in Table 3 are statistically significant (as indicated by p values in the far right column). For example, in Table 3, participants

Table 3
Significant Two-Tailed *t* Test Results Between Schools

Belief condition	Between		<i>t</i>	<i>df</i>	<i>p</i>
	School A (<i>M</i> , <i>SD</i>)	School B (<i>M</i> , <i>SD</i>)			
Current Actual	School 2 (4.81, 0.89)	School 3 (4.00, 1.31)	1.99	71	.003*
	School 2 (4.81, 0.89)	School 4 (3.82, 1.65)	2.01	48	.004*
Current Expected	School 1 (4.37, 2.44)	School 3 (2.74, 1.42)	2.02	41	.002*
	School 1 (4.37, 2.44)	School 4 (2.12, 1.36)	2.02	43	.000*
	School 2 (3.36, 1.84)	School 4 (2.12, 1.36)	2.00	64	.002*
Future Expected	School 1 (5.45, 1.21)	School 2 (4.64, 1.64)	2.00	63	.026*
	School 1 (5.45, 1.21)	School 3 (4.60, 1.58)	2.00	68	.012*
Future Desired	School 1 (5.90, 0.84)	School 2 (6.42, 0.65)	2.00	54	.008*
	School 2 (6.42, 0.65)	School 3 (5.55, 1.45)	2.00	59	.001*
	School 2 (6.42, 0.65)	School 4 (5.76, 1.28)	2.01	47	.010*

at School 2 ($M = 6.42$, $SD = 0.08$) and School 4 ($M = 5.76$, $SD = 1.28$) exhibited a statistically significant difference ($p = 0.010$) in their perception of their teacher identity within the Future Desired belief condition.

Table 4 shows the *t*-test results for participants at each school, conducted to determine if there was any significant difference in their current and future perceptions of the teacher identity (the researcher identity yielded no significant results). For example, participants at School 1 exhibited a statistically significant difference ($p = 0.041$) in their perception of their teacher identity between the Current Desired ($M = 5.27$, $SD = 1.73$) and Future Desired ($M = 5.90$, $SD = 0.84$) belief conditions, indicating a misalignment between their program and their career (i.e., what they want to be doing now is different than what they want to be doing in the future).

In summary, there were significant differences in terms of current and future perceptions of the teacher identity. There were also significant differences between the schools but in different belief conditions. This finding (i.e., that current and future belief conditions are not consistent across institutions) indicates that there are wider issues to be addressed in preparing future faculty.

Focus Group Results: Graduate Student Perceptions of Preparing ePortfolios for Academic Professions

As described in the Methods section, data analysis of the focus group discussions were divided into topics and subdivisions using an iterative, multi-coder process. The primary topics followed the categories that students worked on in their ePortfolios (i.e., research, teaching, service, and lifelong learning), and we also included questions about how students represented their overall professional identity within their digital presence,

where we asked students about the benefits and challenges of constructing professional ePortfolios for their academic careers. Responses described in this section are grouped under six topics: Overall Identity, Research, Teaching, Service, Lifelong Learning, and the role of Reflection in constructing an ePortfolio.

Overall identity. Students saw the task of an integrated ePortfolio as one of constructing a holistic professional identity. For example, one student characterized the process of creating his ePortfolio as requiring a “kind of high-level muse” to produce “a broad picture.” Another student commented on putting together the different pieces for a professional audience:

I thought it was really good just to have something to make you think about these kinds of things . . . I spent a lot of time sitting around thinking about how I wanted to . . . come across to, I don't know, a potential employer or person like that to actually give some thought to how someone else sees your research and you know, other things about you like your teaching and things like that. What kind of a . . . overall impression it creates and how much of that you can even convey on a computer screen.

While platforms such as LinkedIn were also invoked, students agreed that the process of combining not only research but also service, teaching, and lifelong learning resulted in reflecting on and presenting this type of holistic, overall professional identity. This included reflecting on the purpose of these roles as well, as articulated by a student who also maintained other professional online sites: “But, this information about service and lifelong learning, this is, I would think, including them has made me think about these things and their purpose.” By working toward an integrated, overall professional identity, students also noted that gaps would appear:

Table 4
Two-Tailed *t* Test Results Between Current and Future Teaching Roles

		Between		<i>t</i>	<i>df</i>	<i>p</i> -
		Current (<i>M</i> , <i>SD</i>)	Future (<i>M</i> , <i>SD</i>)			
School 1	Desired	5.27, 1.73	5.90, 0.84	-2.11	41	.041*
	Expected	4.37, 2.44	5.45, 1.21	-1.79	39	.081
School 2	Desired	5.28, 1.47	6.42, 0.65	-4.26	48	.000*
	Expected	3.36, 1.84	4.64, 1.64	-3.11	69	.003*
School 3	Desired	4.69, 1.84	5.55, 1.45	-2.36	78	.020*
	Expected	2.74, 1.42	4.60, 1.58	-5.68	81	.000*
School 4	Desired	5.24, 1.60	5.76, 1.28	-1.45	61	.153
	Expected	2.12, 1.36	5.18, 1.47	-8.78	64	.000*

It led me to think about things I can do in the future. I haven't done much with service right now but in the next two years I might do some things I might actually put over there. So it was like good to know these things.

This experience, then, revealed possibilities for future work, and as part of this process, began to connect points on a professional timeline.

Comments on the individual sections of the ePortfolio project also revealed concerns about professional identity and audience. Students characterized the task of writing to an audience as a difficult and central question: audiences included current advisors and professors, potential employers, peers, and friends. The categories suggested in the portfolio curriculum appeared as "a burden and a kind of checklist," but students also commented that it "was nice to have a to-do list," to be able to "see the whole thing at once," and to "identity gaps to work on in the future." The idea of an amorphous audience prompted students to "spend time thinking about how I come across," "how someone else might see my research and teaching," and how to manage "overall impression formation." The challenge was seen as "how to build a narrative" and "how to talk about accomplishments" in a way that "you can show this portfolio to the whole world." As one student summarized, "You have to find a balance."

Research. Many students thought that the research part of their portfolio would be a quick and easy "cut-and-paste" activity but discovered that they needed to "build a narrative," "take the time to translate it to English," make it "comprehensible to the layman," and integrate it with other categories. They also needed to deal with change; two examples included "connecting 10 years of research from undergraduate to PhD work" and communicating "the beginning of a research program that will likely change in the next few years." Finally, the concern of communicating technical research to a broad audience was a particular focus.

However, students were more confident in communicating their research than in the categories of teaching, service and lifelong learning. For example, one student said that he was

not sure that all of this information would be helpful in applying to academic jobs. They might not be interested in some of the stuff . . . [they will be interested] just purely in the publications or the research aspect.

Another student saw value in the portfolio process but also stated precautions about how to communicate research effectively:

It helps you to reflect and helps you create a lot of ideas that you wouldn't have had otherwise. But other people might not read. In engineering and sciences, people are more precise. Ideally, you take reflection and turn it into something more precise.

Other students recognized the value of an integrative approach in constructing an ePortfolio and discussed how including sections on their roles in research could be productively supplemented with information on teaching, service, and lifelong learning. For example, one student who had expected to be able to copy-and-paste from an old research website instead found herself dealing with the concept of a professional narrative:

But now with this there's a structure and there's a format and there's guidance of like, well, this is how you build a narrative and this is how you talk about an accomplishment and so I thought that was really useful.

Part of this student's endeavor involved dealing with "bad experiences," and in dealing with this challenge she realized that "I can build a narrative and I don't necessarily have to put a focus on this thing I didn't

want to talk about. I can still mention it but I don't have to make it the centerpiece." In fact, she ultimately built a narrative that spanned ten years of research experience, "So eventually, I got it. I built a narrative and I think I did well in that." Through the experience of constructing an ePortfolio, students attempted to connect various experiences back to their research trajectories, managed experiences and expectations, and used a variety of approaches to envision themselves in the eyes of multiple audiences.

Teaching. Students also struggled with presenting their teaching experiences, even though three of the school sites were focused on preparing students for teaching through practicum-style experiences. They drew from GTA experiences that were "structured," and they used pre-prepared teaching philosophies for evidence. Also, they hoped that "this teaching experience might be important even for a job that might not involve as much teaching." They valued their teaching but were not always sure how much of teaching to emphasize. For example, one student who planned to apply to both industry and academic jobs worried about impressions on potential employers:

Personal experiences are not as welcome: who are you to talk about yourself? I've been hesitant to want to talk too much about myself openly. In some ways, you're in a stronger position if people know you less. And so you give that up by being open. So, if you talk about how much you love teaching and the people at that company are thinking, "Oh no, it's one of those guys who loves teaching." You can tailor your resume, but not so easily your website.

On the other hand, a student planning on an academic career stated:

If you're in a job interview and they ask you, tell me about a time when you had a successful teaching experience . . . this is a way to actually think about this for a while before you actually respond. And you can put it out there in a way that people can read that and get to know who you are in an interview style rather than just a resume.

Reflecting a more integrated perspective, one student noted that when writing about "the career and life and teaching philosophy—it was hard to differentiate." Again, the challenge of presenting their professional selves to different audiences was central to the activity of constructing an ePortfolio.

Service. Service was a category that varied widely across students—some had extensive service and had to make decisions about whether it was lifelong learning and/or teaching. One student ended up creating "a new

category" that combined teaching, service, and outreach. Other students found that service was a gap in their work as a professional. One student found minimal evidence of service but noted that building the portfolio "led me to think about things I can do in the future." Another student eventually identified several types of service experiences, but stated that "I just had to sit and think and think and think and think."

Students also worried about the stereotypes that might result if they shared certain kinds of service, such as gender and religion stereotypes. Service enters into a personal realm, and one student worried about being stereotyped as a "Bible Belt Christian dude" if he included the service he did associated with his church. In general, students noted that the category of service was less well-defined and more personal; most students placed a high value on service as an activity, but perspectives differed on how much service was connected to their careers.

Lifelong learning. Writing about lifelong learning also prompted students to struggle with the inclusion of their personal life, which in turn prompted reflection on what not to include. In turn, these conversations led to some of the most interesting perceptions about the professional culture of the workplaces that awaited them.

For example, one student "debated intensely" about including her wedding picture, which she valued because it was high quality but also because the wedding was in a building that was related to her work. She described the struggle as difficult:

Because it's a wedding picture. [laughs] But I wanted to include it because I got married at a really cool place [that relates to my career]. So, it's, you know, relevant. And I debated, do I put it? Do I not put it?

One member of the group added the suggestion, "You could always just Photoshop the color of the dress" only partly in jest, and the students continued to discuss her dilemma in terms of balancing her "real life" and the perceived judgment of the professional community. She concluded,

I just . . . I mean I'm a girl, right? I was thinking, it's like, well, of course, it's a woman. Of course she is talking about her wedding. Duh. But it's like, I, I ended up just picking one of the main pictures that our photographer put in his blog and everything because it's a wide shot and you can see the [building and equipment], and I'm this tiny thing in the picture.

Then, another student expressed a different perspective on academic professional culture:

The other thing that brings up is like, if it's for something that people who are trying to hire you for professor jobs and they see that picture and like, crap, we're going to have to hire her husband too. The whole two-body problem thing.

None of the students in the group denied that professional culture could be a detrimental force in portfolio choices.

This pattern of subjugating the personal to the professional self also appeared in other discussions about lifelong learning. Another woman also worried about gender stereotypes in her choice for lifelong learning: she was a cook and cake decorator who used these skills to help student organizations with fund-raising events, but she worried that these skills wouldn't look as "interesting" or "impressive" to a male-dominated engineering community.

Constructing a lifelong learning section also posed challenges that required students to draw on integrative thinking. Students noted overlaps between categories and struggled with the relevance of lifelong learning to potential employers. However, other students described the category of lifelong learning as relevant and were able to map personal activities to qualities that would be valued in the workplace. For example, one student explained,

Writing about playing in a string quartet related to my professional life; it provided me a place for reflection about not only a way to relax and time to recharge, but also it allowed me to work closely with a group of people over a long period of time. It gave me a chance to show my personality rather than these canned profiles that everyone writes out.

Students also connected lifelong learning activities specifically to their roles as teachers who model professional life as well-rounded and grounded beyond academia. Finally, one student situated the importance of lifelong learning in terms of an overall professional identity:

It's important for PhD students. We're supposed to be intellectuals, continually challenging ourselves with research but also outside of research in different areas. Learning a musical instrument or learning a different language. It shows you're interested in continually developing yourself.

To summarize, students struggled with bringing together different aspects of their personal and professional values as lifelong learning, and they found it difficult to determine how and whether to share these components with a professional audience; yet, this category of lifelong learning also resulted in the most

integrative perspectives of role identity both within and beyond their academic contexts.

Reflection. In general terms, many of the students noted benefits from the process of constructing an ePortfolio, particularly the benefits of reflection. Students particularly saw reflection as a way to identify and understand accomplishments. As one student noted, this process was valuable not only for creating a website but also for learning how to present their accomplishments to potential employers:

I look back and see wow, I did a lot of things, and know a lot of things, and have experiences, and it's nice to have thought about that before going to talk to someone and understanding how this teaching experience might be important even for a job that might not involve teaching. I think it is a useful exercise even if I don't use the webpage explicitly.

As seen in each of the categories, students continually reflected on their audiences, citing the importance of "focusing for a general purpose audience and a professional audience at the same time," worrying about "seeming arrogant," and the idea of providing your own "history . . . one step back from what we guard of our public persona." From the preponderance of such concerns, it is evident that the process of "curating" components of their professional and personal lives helped students create cohesive narratives and be more cognizant of their developing roles as professionals.

Concluding Remarks

This study explored the questions, "Do graduate students believe that their current experiences align with the roles they will perform in their academic careers?" and "How do graduate students' perceptions of their professional roles change during the process of constructing portfolios?" We analyzed quantitative results from a survey designed to measure students' perceptions of alignment between their current graduate experiences and their future careers, focusing on belief conditions about role identities as researchers and teachers. We also reported qualitative patterns from focus groups conducted with students who reflected on different components of their professions via constructing ePortfolios.

The survey findings suggest that misalignment exists in student perceptions of teaching role identities between current and future scenarios, while perceptions are more balanced in regard to research role identities. Furthermore, the quantitative results suggest that preparation of future faculty varies across institutions, even in programs that have developed practicum programs that explicitly seek to prepare students for academic careers.

The focus group discussions concentrated on students' responses to ePortfolio work that tasked them with providing evidence of accomplishments and with reflecting on multiple components of professional identity. Patterns from this data suggest that this process prompts students to engage in integrative thinking that involves processes of professional identity construction, which agrees with previous ePortfolio studies (Sattler & Turns, 2015; Turns, Sattler, Eliot, Kilgore, & Mobrand, 2012). The concerns highlighted by the students also show that they were engaged in a more cognizant "presentation of self" (Goffman, 1973), requiring communication that envisioned both their own goals and their multiple audiences.

This work also shows that graduate students can experience feelings of disconnection between their graduate experiences and their intended careers, even when those careers are in academia, and that constructing ePortfolios with multiple components can support reflective and integrative thinking that may mitigate that disconnect. In particular, students described positive outcomes from engaging in the challenge of writing narratives that incorporated experiences over time and accomplishments across roles. For example, creating portfolios that address the multiple role identities in their current and planned professional lives helped them identify and address gaps, discover and promote their strengths, and explore ways to balance their efforts and goals. As graduate students balance a variety of roles (Cast, 2003; Sweitzer, 2009), this type of practice and integration is important for both personal and professional development. The process also prompted them to consider their own professional image in view of large, amorphous audiences and to intentionally curate their digital presence.

These findings could be informative for graduate programs, especially those seeking to prepare future faculty. This misalignment of role identities between perceptions of graduate school and of future careers indicates that at the very least, graduate students experience feelings of lack of preparedness, which may indicate that graduate programs are not adequately preparing students for the roles their future careers will demand of them. We must ask whether we are disadvantaging future faculty and their students with programs in which current perceptions and future expectations are different. This national problem can be addressed at individual institutions but actually needs attention at the broader workplace level, as called for in the Boyer report on undergraduate education and the academic profession (Boyer, 1987; Boyer, Altbach, & Whitelaw, 1994) and supported in programs such as the National Engineering Teaching Institute (Felder, Brent, & Prince, 2015).

While practicum programs and research experiences help prepare graduate students for their roles as professors, activities like ePortfolios can enhance these experiences by giving students opportunities to envision possible selves and begin balancing their values and goals across roles of researcher and teacher. These types of reflective activities may even help students increase the quality of their work as graduate students and faculty and to examine productively ways to achieve work-life balance. The students in this study demonstrated that the ePortfolio process helps students examine struggles in ways that help them deal with imbalances along the way, making explicit the tacit assumptions of the profession and foregrounding internalized values and behaviors.

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Acknowledgements

We are grateful to the students and facilitators who participated in this study, and to the reviewers who helped improve the quality of this article. This material is based upon work supported by the National Science Foundation under Grant No. 1055595. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.

Institutional Assessment and the Integrative Core Curriculum: Involving Students in the Development of an ePortfolio System

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The majority of research on the implementation of ePortfolios focuses on curriculum, faculty development, or student buy-in. When ePortfolio systems have been described in technical terms, the focus has been on the functionality, affordances, and limitations of ePortfolio systems (e.g., TaskStream, LiveText), free web tools (e.g., Google Docs), and course management systems (e.g., Sakai). Seldom do researchers discuss the socio-political context that leads to the development of the ePortfolio design or architecture; more importantly, seldom are students involved in the decision-making process about assessment and learning. Rather, students are treated as data for the improvement of ePortfolios rather than significant stakeholders during development. Our pilot project with students as co-authors and research assistants illustrates one approach for colleges and universities interested in the implementation of an institutional ePortfolio. Our findings show that the design of ePortfolios should not be treated as neutral and unproblematic. According to our student authors, the affordances of ePortfolio design mediate their thinking and level of engagement in regards to affect and identity. Our pilot project also shows that students can and should play a larger role in institutional assessment.

The European Institute for E-learning defined an ePortfolio as “a personal digital collection of information describing and illustrating a person’s learning, career, experience, and achievements” (2015, p. 1). The use of electronic portfolios in education has a rich history. Prior to the popular use of the Internet, users would save electronic portfolios on 1.44MB floppy disks. Soon after, CD-ROMs, with available storage space of 650 MB, were widely adopted to store larger mixed-media files. Since the mid-1990s, increased Internet speeds, web resources, and data storage at decreasing costs have made it possible for educators and students to experiment with different websites (e.g., Google sites), web tools, course management systems (e.g., Sakai), and ePortfolio technologies (e.g., LiveText, TaskStream). Unlike paper-based and text-based portfolios, electronic portfolios allow users to embed digitized multimedia content (e.g., video, image, interactive graphics) and hyperlinks, utilize search features to locate content quickly, and share work across a distributed social network. In a comparison between traditional and electronic portfolios, Barrett (2007) stated that technology enhances archiving, linking/thinking, storytelling, collaborating, and publishing.

Although paper-based portfolios have long been used by artists, journalists, writers, and architects to document a person’s life works or development, the systematic adoption of electronic portfolios in higher education is a somewhat recent phenomenon. Early adopters were from professional schools, such as teacher education, nursing, and engineering. In professional schools and programs, state standards and assessments were dictated by accrediting bodies; ePortfolios functioned as a new delivery system to streamline the process. These early adopters did not

view ePortfolios as necessarily transformative in regard to student learning and agency. Use of ePortfolios for outcomes assessment has more than tripled between 2009 and 2013 (Eynon, Gambino, & Török, 2014).

Recent research suggests that ePortfolios offer promising opportunities for improving both learning and assessment (e.g. Cambridge, Cambridge, & Yancey, 2009; Eynon et al., 2014). In their review of LaGuardia Community College’s ePortfolio initiative, Eynon et al. (2014) highlighted the integrative potential of ePortfolios to “help students link and make meaning from various learning experiences” (p. 96). Cambridge et al. (2009), in their edited collection of studies from 20 institutions, asserted that ePortfolios offer “an antidote to the inadequacies of testing” (p. 195) and provide opportunities for students to take a “greater role” in discussions about learning as they “document, reflect on, and analyze what occurs during their own learning processes” (p. 196). Certainly, authentic student engagement is as critical to assessment as it is to learning, as demonstrated by ETS researchers Liu, Bridgeman, and Adler (2012), who measured substantial improvement in test scores of students who were given incentives to do well—who, that is, felt that they had a stake in the results. Likewise, Lizzio and Wilson (2013) argued that transparency and clarity are key to improving student engagement with tasks. While these studies focus on non-portfolio assessments, they underscore the value of recognizing students as stakeholders.

Such recognition means more than offering incentives or making assessments more transparent. Historically, students have been excluded from discussions about institutional assessment. For example, teacher education students would not be involved in the ePortfolio development phase, where

information architecture and relationship to student learning and assessment are discussed. Certainly, many programs have attempted to include student input. For instance, the University of Delaware's ePortfolio expansion effort involved interviews and surveys with students, as well as faculty (University of Delaware). However, the primary representation of students in the assessment process is in the form of artifacts to be scored and converted to data. Decisions about ePortfolio design and policy should not only be made for students, but with students, as well. As researchers and educators, we must function as assessment sponsors and invite students to the discussion of ePortfolio design and policy.

How can we include students in these processes? What might student perspectives on institutional assessment offer? This paper reports on a semester-long pilot project that involved four undergraduate Writing majors at a private liberal arts college in the development of an institutional ePortfolio in its early stages of implementation.

Research on Electronic Portfolio Design

Zaldivar, Summers, and Watson (2013) classified two types of ePortfolios: product-based portfolios and process-based portfolios. Product-based portfolios have been perceived as a reliable assessment method, whereas process-based portfolios have been viewed as "too loose, too flexible and hence preventing scaffolded, guided facilitation of learning" (p. 223). Long-time scholar of ePortfolio theory and practice, Helen Barrett (2007), distinguished between the two portfolio types according to their educational and rhetorical purpose—process-based portfolios are student-centered, contingent, and messy, mediating reflection and assessment *for learning*; product-based portfolios, in contrast, showcase knowledge and function as assessment *on learning*. Barrett (2007) argued that we are losing the stories that students share about their learning in exchange for checklists of skills. Zaldivar et al. (2013) stressed that product-based portfolios, as an assessment option, are ideal when compared to traditional test-based assessments. Moreover, a process-based portfolio structured as a "messy" representation of a student's cognitive journey may not be ideal to show to potential employers or graduate programs, whereas a product-based portfolio would provide a more coherent, linear narrative. Although process-based portfolios can reflect genuine learning, they fail to evaluate institutional programs structured around very specific learning objectives and outcomes. Some degree of standardization is needed for administrators to make generalizable claims regarding the quality, effectiveness, and shortcomings of a program. To reconcile tensions between different

portfolio types, Barrett (2007) recommended a design approach that integrates an archive of student work, a multimedia/multimodal authoring environment, and a standards-based assessment program.

Scholar and educator of ePortfolio design, Kathleen Blake Yancey (2004), distinguished between print and electronic portfolios according to their affordances. Traditionally, print portfolios have been organized in three ways: (a) by genre, (b) by learning outcomes, and (c) by an intellectual framework (e.g., guiding questions, themes, or principles). Similarly, digital portfolios have been structured in three ways. First, online assessment systems such as TaskStream have been used to organize student work. Each student works with the same interface and web tools and houses his or her work for program assessment. Yancey (2004) described the second model as the "print uploaded" portfolio in which the content, arrangement, and rhetorical purpose mirror the print portfolio and do not exploit the digital affordances of a hypermediated, multimedia/multimodal environment. In the third model, the student takes full advantage of the web presence by using hyperlinks, images, video, etc. Unlike the print portfolio, remediated from the book, which evinces a linear narrative of progression, the digital portfolio allows students to communicate multiple narratives through different modes and media. Yancey (2004) used the metaphor of the *gallery* to describe a unified fragmentation that exists within the online space. Within this space, artifacts can be articulated, repurposed, interrogated, and reflected upon. Much like a palimpsest, the digital portfolio is multi-layered and complex in its construction.

Barrett (2007) cites Paulson and Paulson (1994), who classify portfolios as either positivistic or constructivist in design and intent. The positivist (or assessment) portfolio is based on learning outcomes that have been appropriated externally, not by the individual student. According to Paulson and Paulson, positivism "assumes that meaning is constant across users, contexts, and purposes" (p. 7). In this model, a portfolio is evidence of whether or not students effectively met the learning outcomes. A constructivist designed (or learning) portfolio, on the other hand, "assumes that meaning varies across individuals, over time, and with purpose" (Barrett, 2007, p. 440). In this model, students construct narratives of their learning through the selection, organization, and reflection of artifacts. In sum, the positivist-assessment portfolio would be an assessment of learning, whereas the constructivist-learning portfolio would be an assessment for learning (Barrett, 2007).

Student Agency and Institutional Constraints

In binary descriptions of portfolios, there tends to be an "us versus them" approach, in which institutional assessment is perceived as the antithesis to learning,

while the student-centered portfolio is the embodiment of authentic learning. The difference between process/product-based portfolios or positivistic/constructivist portfolios has less to do with student learning and more to do with what counts as academic currency in a hierarchical system in which students have little influence or power to change that currency. For example, in colleges where institutional portfolios function as a graduation requirement, standardization ensures that each student fulfill the same minimum requirements to obtain a degree. In addition to grades, the most common currency in an educational system, ePortfolios are marketed as alternatives or supplements to traditional assessments and grades. Overly prescriptive ePortfolios, on the contrary, can produce the same effects as traditional models, minimizing student ownership of learning (Zeichner & Wray, 2001). Institutions market ePortfolio software as student-centered, noting web-authoring tools and resources as opportunities to share with non-academic stakeholders (e.g., potential employers, graduate programs, and social media). However, to develop a system that satisfies the needs of all stakeholders (e.g., administrators, educators, ITS, and students) is untenable (Yancey, 2004). Yancey (2004) stated that the problem with the institutional assessment portfolio is that “each portfolio has *two* composers, (1) a student and (2) the system, with the system’s override capability exerting greater authority” (p. 745). Thus, the design and objectives of institutional portfolios ultimately limit student innovation and freedom of expression. In addition, if students fail to meet the standardized requirements, the product of their academic labor cannot be exchanged for a degree and holds little value in this particular economic system.

Wilhelm et al. (2006) warned that a “significant challenge exists when the same e-portfolio system is used both for student-centered purposes and for satisfying institutional needs such as program evaluation and accreditation” (p. 63). For Wilhelm et al. (2006), it becomes problematic to conduct research in this area because the terms *electronic portfolios* and *electronic assessment systems* are used interchangeably. In theory, ePortfolios have the potential to transform student learning, establish a dialogical and collaborative relationship between educators and students, and influence global changes in education. The bureaucratic problems that arise with large-scale electronic assessment systems suggest that portfolio pedagogy is inherently flawed. Barrett and Wilkerson (2004) acknowledged this dilemma regarding ePortfolios and electronic assessment systems when they ask, “How do we match the needs of the institution for valid and reliable data for accreditation and accountability while still meeting the needs of learners for formative assessment to enhance and support the learning

process?” (para. 17). When ePortfolios are viewed as a type of currency within a hierarchical system, there is little compromise: a student’s work either counts or does not count for graduation.

One motivation for large-scale ePortfolio assessments is the impetus to acquire validity and reliability, allowing administrators to formulate generalizations about student performance and comparisons between large groups. Huot and Williamson (1997) explained that large-scale assessment is always situated in political contexts in which tensions exist between multiple parties: for instance, taxpayers demanding accountability versus administrators, educators demanding academic autonomy versus administrators, or students demanding grades for degrees (or in some cases, academic freedom) versus educators. Huot and Williamson (1997) wrote,

The fact that students are compiling portfolios or writing in their classes with their teachers’ and classmates’ help is secondary. The ultimate authority in these situations has nothing to do with the activity in the classroom which produces the portfolios themselves. Instead, they are being used to generate scores which can support the reform movement. (p. 51)

In the end, assessment results are data used as evidence by various stakeholders to marshal arguments for additional (or reduced) resources and funds, accreditation requirements, and/or policy changes.

Thus, while many advocates of ePortfolios emphasize the importance of students in the assessment process, the hierarchical structure of institutional assessment necessarily marginalizes students. Driscoll and Wood (2007) wrote that educators presume that they need to direct student learning and “have seldom asked students about what kind of learning outcomes are important for their studies” (p. 58). Even advocates of student agency struggle, as evidenced in Light, Chen, and Ittelson’s (2011) guide, *Documenting Learning with ePortfolios: A Guide for College Instructors*, in which they consistently speak of students as owners of their ePortfolios, but ultimately trace a highly constrained role for students. We are, of course, not the first to critique assessment or portfolios. While even proponents recognize many of the problems inherent in the process, Jensen (2010) argued that we may fall victim to a “will to student empowerment” (p. 129) and miss the ways that portfolio assignments can actually reify existing hierarchies. Yancey’s (2011) response cites Joyes, Gray, and Hartnell-Young (2010), which analyzed ePortfolio implementations and noted the potentially disruptive nature of student ownership. However, while their very definition of ePortfolio

emphasizes learner ownership and management, they identify this as a threshold concept—an idea that once understood wholly and irretrievably alters one’s perception—noting that “e-portfolio implementation can be like a game of snakes and ladders where initial rapid progress can suffer major setbacks due to a poor understanding of the nature of e-portfolios” (p. 25). Failing to fully comprehend the implications of student ownership, then, can undermine the goals for ePortfolios.

Though inclusion of students at the level of classroom evaluation is not a radically new idea, particularly in Writing Studies (e.g., Danielewicz & Elbow, 2009; Inoue, 2005; Tchudi, 1997), the highly constrained role of students in ePortfolio design reflects the fundamental view of students throughout higher education. Whether students are considered children (as under *in loco parentis*) or consumers, they are rarely included in significant decision-making. Following the student protests of the 1960s and 1970s, longtime administrator Louis Benezet (1981) argued, “It is time to increase student membership on policy committees from tokenism to fair proportions” (p. 713). Benezet (1981) argued for the inclusion of students in everything from student affairs to curriculum development to institutional planning. Decades of scholarship viewed such inclusion as essential to creating a responsive, democratic campus culture (Benezet, 1981; Boland, 2005; Hawes & Trux, 1974; McGrath, 1970; Zuo & Ratsoy, 1999). Yet despite research on student inclusion in higher education, students continue to be excluded from decision-making and are frequently unaware of opportunities that do exist (Menon, 2003, 2005).

ePortfolio Design and Implementation at Ithaca College

Ithaca College is a comprehensive private residential college with around 6,700 students, mostly undergraduates. Founded in 1892 as a music conservatory, the college has always sought to balance a professional orientation with a liberal education, with individual schools maintaining their own general education requirements. Over the past two years, in part in response to accreditation pressures, the college instituted a brand new college-wide general education program. This Integrative Core Curriculum (ICC), which began full implementation in Fall 2013, is the main pillar of the IC 20/20 strategic plan, which promises to prepare students to be integrative thinkers and collaborative problem solvers.

The ICC (n.d.) website defined integrative learning as “the process of making connections among concepts and experiences so that information and skills can be applied to novel and complex issues or challenges”

(para. 1). In other words, integrative learning seeks to enable the transfer of strategies and ideas from one context to another. We want students, for example, to be able to take what they have learned in the required first-year writing course to assist them in understanding and composing arguments in a politics class, or to take the concepts learned in macroeconomics and use them to make sense of complex problems in an advanced business seminar. ICC utilizes a “themes-and-perspectives” model in addition to requiring courses that emphasize diversity, quantitative literacy, and writing. To help students develop and demonstrate integrative learning, the college decided to roll out a brand new ePortfolio system along with ICC, with students collecting artifacts throughout their college careers.

The rapid development and implementation of this new general education system—a radical change in both form and scope—has necessarily prompted resistance, both to the substance of the system (with its emphasis on assessable student learning objectives [SLOs]) and to the process, with some faculty arguing that there has been insufficient time for careful deliberation. Students have also expressed concern about the process, including coverage in the student newspaper and direct questioning of administrators at student government meetings. This new general education curriculum, with its key ePortfolio component managed by TaskStream, thus presents both a challenge and an opportunity for the college. In the context of skepticism and resistance on the part of faculty and students, student buy-in becomes even more essential for successful implementation.

It is important to stress that what ePortfolio researchers and program leaders mean by a term like *implementation* varies across publications. On the Catalyst for Learning (n.d.) website, 24 campuses report on the success and challenges of implementing ePortfolio initiatives at their campus. At the University of Delaware (2013), their explanation of the implementation process began with the development of a conceptual framework based on the Inter/National Coalition of E-portfolio Research. Faculty members discussed their educational goals for undergraduate students. At Virginia Tech (2013), their scaling-up story is described in four phases, over a range of six + years. In the first phase, faculty pursued ePortfolios independently or within professional programs. In the second phase, there were systematic efforts to bring technology and pedagogy to the forefront. For the third phase, there was an institutional commitment to build an ePortfolio agenda for different purposes. At the present stage, the campus has adopted social pedagogies, reflective practice, and assessment.

In Hains-Wesson, Wakeling, and Aldred (2014), ePortfolio implementation at a university in Australia

emphasizes more the ongoing technical instruction/support and professional development of faculty around the use of a new, open-source ePortfolio software. In contrast, our present study focuses on an early phase of implementation: the intersection between a major overhaul of our general education program, the design of the ePortfolio software, and development of assessment policies for student learning and program review. As part of this early implementation phase, Mary Lourdes Silva coordinated the development of two separate ad hoc committees—one charged with creating the Directed Response Folio (DRF) within TaskStream (Figure 1), and the second charged with creating rubrics for each of the SLOs for ICC. The first committee was presented with the challenge of mapping the new ICC onto the new ePortfolio software. Due to her background in portfolio pedagogy and theory, Silva found it important to serve on both committees. At the same time, both authors collaborated to conduct a pilot study on ePortfolio design and implementation with four Writing majors. Silva attended biweekly meetings, reporting out on the results of the pilot study to both committees. Much of the literature focuses on portfolio design as a game changer when it comes to curriculum. It facilitates self-assessment and reflection (Rickards et al., 2008), integrative learning (Light, Sproule, & Lithgow, 2009), folio thinking (Chen & Mazow, 2002) and self-regulated learning (Massey, 2009). For that reason, Silva deemed it essential to include student input during the early design phase.

Part of the early discussions about TaskStream was the idea that this ePortfolio would solve all of our educational woes. First, it was supposed to direct students away from a checklist curriculum, which was perceived as a central problem with our old general education program. Second, it was supposed to assess the new general education program, ICC, which had been redesigned from the ground up. Third, it was perceived as transformative in that it would foster student autonomy, intentionality, metacognitive thinking, and self-regulated learning. Last, the ePortfolio was seen as a way for students to produce a showcase portfolio to professionalize their academic work for various stakeholders. There were, however, several contradictory objectives. To the committee, it was paramount that students take ownership of the ePortfolio and have the opportunity to upload any artifact in any medium or mode, so long as the artifact met the indicated SLOs. However, it was equally important to the committee that for assessment purposes, submissions should be “locked.” In other words, after a set date students would not be capable of re-submitting artifacts. Assessment of selected ICC elements from the preceding semester are completed twice a year, in January and in May. In theory, students

could revise and re-submit artifacts during the Spring semester or submit work from other courses, so long as the new artifacts met the target SLOs. This is great for student learning because their understanding of the SLOs may evolve, and the evidence they wish to provide may change as their awareness changes. For assessment purposes, however, this presents problems because currently the ePortfolio software does not track which students resubmitted work; moreover, it does not segregate these students from the general population. Consequently, it would be difficult to evaluate the program efficiently.

Silva presented this contradiction to the committee; however, members did not find it to be a problem because they believed that artifacts would inevitably improve from freshman to senior year. This learning narrative is based on the assumption that cognitive development follows a linear regression line, a narrative that has more to do with validating instructor-designed pedagogy and curriculum and less to do with understanding learning in real time across various academic and non-academic contexts. In reality, learning can be messy and recursive, sometimes moving two steps forward and three steps back. One technical solution to resolve these contradictory objectives is to embed interconnected systems within the ePortfolio software. Barrett (2007) recommended that the ePortfolio software include an archive of student work, program assessment, and authoring tools. In other words, it should include a space for students to develop product-based and process-based ePortfolios. A technical solution in this case, however, does not change who actually controls the grand narrative for student learning and achievement. In sum, when it comes to institutional assessment, there are irreconcilable differences between product-based and process-based portfolios.

As noted earlier, the new curriculum was developed relatively rapidly, creating confusion and uncertainty. What were the principal functions of the ePortfolio? How would it work? What options would programs and students have? While TaskStream is designed to accommodate both product and process-based portfolio models, what policies need to be put in place? What technology and support will be needed? These decisions have significant implications for the amount of freedom individual programs, faculty, and students will have in shaping the ePortfolio.

Student Implementation of Pilot ePortfolio

To help us consider these important concerns, we recruited four senior Writing majors to assist us in piloting the ePortfolio. While these students were part of the now-defunct general education system, their expertise, as advanced students, was invaluable.

Figure 1
TaskStream ICC DRF Webpage

The screenshot displays the TaskStream ICC DRF Webpage. At the top, the 'taskstream' logo is on the left, and user information for 'Mary Lourdes Silva' is on the right, including 'My Account', 'Logout', 'IM', 'Help', and the 'ITHACA COLLEGE' logo. A navigation bar below contains tabs for 'Folios & Web Pages', 'Lessons, Units & Rubrics', 'Standards', 'Communications', 'Resources', and 'TS Coordinator'. The main header area includes 'Analytics' and 'ICC Faculty Training' with a 'Template: ICC Faculty Training' dropdown, a 'Preview as Folio' button, and action buttons for 'Work', 'Comments', 'Scores/Results', and 'Options'. A left sidebar lists various artifact categories under 'General Information', such as 'Themes and Perspectives' (Ithaca Seminar, Creative Arts, Humanities, Natural Sciences, Social Sciences), 'Academic Writing', 'Diversity (DV)', 'Quantitative Literacy (QL)', 'Writing Intensive (WI)', and 'Complementary Liberal Arts (CLA)'. The main content area contains a 'Welcome to the ICC Faculty Training program' message, a 'Getting Started with Programs' section, and a 'Program Links' section with a 'More Help' box.

Throughout the spring of 2013, supported by college grants, we worked together to review relevant research, interview faculty, and analyze rubrics. From this collaborative process, we were able to identify four typical ePortfolio design approaches: course-based, levels, SLO, and open-ended. In the course-based approach, students must submit artifacts from core courses in their major or program. The levels approach is similar, in that artifacts must be submitted from freshman, sophomore, junior, and senior courses. Slightly more open-ended is the SLO approach, which allows students to upload any artifact so long as they can articulate a rationale for how the artifacts meet the designated student learning outcomes. In the last design model, the open-ended approach, students determine for themselves the rhetorical objectives of the ePortfolio and determine which artifacts meet those objectives. The four Writing majors on our team each selected one of the ePortfolio design models and took several weeks to construct their individual ePortfolios.

As a group, we identified three key themes that emerged from the student narratives, as well as shared attitudes and responses to the four ePortfolio

design models. First, each student's *identity* as a writer was foregrounded, in terms of both control over ePortfolio design and awareness of how work would be received by potential audiences. Second, students' rationales for the selection of portfolio artifacts emphasized *affect*, as students described their emotional relationships with the writing. Third, students' approaches to artifact selection tended to emphasize either a *holistic* or *cohesive narrative*; that is, they either assembled a range of artifacts that created a holistic account of their four years' work, or they selected artifacts that emphasized cohesion and integration among their courses. For this paper, three of the four chose to participate as co-authors and reflect on their experiences.

Identity

The question of identity figured prominently in students' articulations of why they selected a particular ePortfolio design. Ruth Jackson majored in Writing with a minor in Deaf Studies. A born storyteller, Jackson took courses in playwriting and poetry, in addition to performing with a signing choir on campus.

Her choice of the levels approach emphasizes the importance of her identity as a creative individual:

Creativity is in my blood and runs through every endeavor and project I pursue. I've never been able to fit inside any mold an authority figure has set in front of me. Each one of us is unique and should be treated as such. This is the main reason why I chose the levels approach for my ePortfolio. We were given the opportunity to be flexible in putting however many artifacts in the ePortfolio. This approach gave me the ability to choose different types of writing as well as how many.

Jackson viewed the final, senior level as representing how the various threads of her identity came together in her senior project,

a novel about the stereotypes of deafness and the hearing, because I was able to use everything that I learned and develop a story of my own choosing. Deaf culture fascinated me ever since I started learning American Sign Language in high school. I just knew that I would use my senior project to encompass both my passions, writing and Deaf culture.

Jolene Cochran majored in Writing with a concentration in Creative Writing and minored in Art, German Language Studies, and the Honors Program. Her reflection focused on the affordances of the open-ended approach:

While I am theoretically a "digital native," I've never had the latest gadgets, known the best programs, or been privy to the kind of technological awareness that my classmates seemed to grasp intuitively. During high school, I began experimenting with blogging, because it is almost the proverbial destiny of an American teenager who "journals" to write a blog at some point or another. Sites such as Posterous and Blogger were ideal for a tech-neophyte like me: they gave enough guidance to be easily navigable but also provided a wide range of design and layout options so that I still felt as though I could impose my own identity upon the blog and control its tone. Though my confidence with technology has grown over the years and I no longer need that same type of hand-holding, the concept of the blog stuck with me. So when I began the ePortfolio process, a blog was what I imagined.

Echoing Yancey (2004), Cochran sought to create a digital space in which artifacts could be articulated, repurposed, and reflected upon:

After reading Carpenter, Apostel, and Hyndman's (2012) "Developing a Model for ePortfolio Design: A Studio Approach," I was even more set on this kind of blog-like structure where written, visual, and aural elements could be intertwined to reflect a student's identity, skills, and knowledge. Though this study focused primarily on the importance of periodic peer and faculty review, it also stressed the idea of the ePortfolio as an art object where "multiple modes come together to form a powerful communication object" (p. 170). Based on this idea of multi-modality I knew I wanted to integrate design into my own portfolio, but also wanted the artifacts to reflect my experiences as a Writing major at Ithaca College.

Cory Olivares is a creative writer who completed a fantasy novel as his senior project. His reflection emphasized his identity as a highly focused transfer student:

I did not necessarily go to college as a pathway to a set job, or riding the post-high school wave into what many refer to as the college experience. Being a transfer student, and wanting mainly to learn how to write in order to become a self-sufficient author, my creative works in the classroom were my most valued. The ePortfolio system gave me a way to easily organize my documents from my transfer school and IC into a cohesive package that I could take with me post-graduation. The course-based approach allowed me to choose which writing courses and artifacts I wanted to showcase. It also allows students to demonstrate their own personal identity, whether it be a love of writing fiction, creative nonfiction, or a certain theme like writing about nature.

Affect

Identity for the three student authors includes a passion for particular kinds of work, the deep emotional connection writers have with their own creative efforts. Emotional connection with individual pieces of writing played a key role in artifact selection, as students recalled the strong emotions from when they first developed that artifact. That is, they chose work that had been particularly meaningful or enjoyable at the time of creation. Jackson's first selection was an essay from Introduction to the Essay, the required gateway course for Writing majors, which shifted her understanding of what writing and creativity could be:

This researched essay on beading granted me the opportunity to talk with a professional who owns a

beading store. She shared with me the different crafts one can make and the types of beads that come from all over the world. Beading has been a part of my life since I was elementary age and continued to grow with me. Now, I spend time and money to make jewelry not only for myself but for others as well. I wrote this essay with passion and vigor for two reasons, one being the fact that I love the craft and two because I believe this is a form of art. I remember we had such a debate about whether or not beading should even be considered art.

For Cochran, too, the emphasis was on choosing artifacts that represented growth or challenge:

Choosing the artifacts as well as categorizing them proved to be much more challenging than I had originally thought. I tried to choose pieces that would fulfill the criteria for both the ePortfolio rubrics while also choosing pieces I felt were essential to my growth as a writer. Many times the pieces I chose were ones that I can firmly say were *not* good pieces of writing, but instead demonstrated some failing that I had since rectified, such as my freshman essay in which my thesis completely got lost in the kerfuffle of description and prose. Still other artifacts were ones that I was particularly proud of, such as my pieces for the college's senior art show and my capstone project.

Olivares noted the tension between institutional expectations that are built into student learning objectives and students' own affective relationship with their scholarly and creative work:

While I respect and understand the importance of the general education courses such as the science and history ones, I didn't really value the artifacts that came out of it for their quality and as they pertained to my overall goal for the ePortfolio. I also wanted to showcase a wide array of my own personal works that I loved. While the ePortfolio structure allowed you to submit any number of artifacts per category, trying to fit certain artifacts into sometimes restrictive guidelines (and vice versa) felt forced. I didn't like placing a story I really loved under simply "shows rhetorical literacy." I felt that this devalued my work and found myself trying to find artifacts that I might have otherwise not enjoyed, but that fit well into the given subject. Thus, after graduation I would have a portfolio that pleased the ICC guidelines, but was essentially alien to me.

Narrative

Olivares's concern highlights the students' desire to craft a narrative that would fully and truthfully represent themselves. Their approaches to artifact selection tended to emphasize either a *holistic* or *cohesive narrative*; that is, they either assembled a range of artifacts that created a holistic account of their four years' work, or they selected artifacts that emphasized cohesion and integration among their courses. Jackson, for example, noted how she overcame her initial reluctance to include early writing in the portfolio by considering the way the artifacts came together to demonstrate her development as a writer:

I didn't particularly like to share my horrible writing from back then and on top of that, I was also self-conscious. I didn't feel confident in myself as a writer. As I progressed through this project, I found out that my writing wasn't awful if you look at it as a freshman piece. Seeing how one has grown is always a good thing. Through this, I saw my strengths and my weaknesses. No one really becomes a perfect writer. We all learn from each other and continue to strengthen our pieces.

Olivares acknowledged the potential value of crafting an ePortfolio that would enable him to define himself according to a body of work, rather than a transcript. While emphasizing his desire to create a cohesive narrative that effectively represented his identity, he expressed frustration with the ways in which an assessment-driven ePortfolio design undermines such efforts:

One great benefit of ePortfolios is that they allow students to leave their institution with a set of organized works to present to employers and to keep for themselves. This is so important, because plenty of people can graduate with top grades and honors, but really what does that mean without substantial artifacts? I could have graduated without a single piece of my writing saved, cast out to the working world without a sole piece of craft, and I would have gotten the same degree as my peers. Especially as a writer, it is the writing and works that come from the past years that matter, not the grades.

As a fantasy writer I of course need to draw on my life outside of the classroom, but honestly it seems obvious that I would want to stay as far from reality and my own life as possible. So then, where does that fit? Am I not to use an artifact because it does not resemble my own life at all? Also, the definitions for works did not meet what I wanted out of this whole ePortfolio process in the first

place. They really took the sense of identity and personality out of the ePortfolio making process, leaving just this feeling of systemization and being a number.

Like Jackson, Cochran recognized the value of demonstrating her development as a writer. In selecting her artifacts and designing her own approach, she found she was able to construct a meaningful narrative that combined the holistic and cohesive schemes.

My own college learning experience was a slog towards proficiency rather than a leap, a slow process in which I struggled to integrate what I'd learned into my writing and into my life. Thus, it seemed to make the most sense to present my portfolio in a developmental fashion by providing writing artifacts from each year so as to show my progression. Yet I also wanted to showcase other subjects which had influenced me throughout my four years in school, such as art, German, and creative writing. To achieve this cross-disciplinary structure, I opted to create my own DRF template, which is an aspect of the TaskStream site that essentially allowed me to create my own organizational structure as opposed to using a prearranged format. Though this was probably the more complicated choice in the end, being unfamiliar with the technology, it seemed like the best option at the time.

Like Olivares, Cochran struggled with the assessment-oriented structure of the ePortfolio, noting the challenge in locating artifacts that effectively represented connections across educational experiences, but found that in the process of struggling to identify those connections, she was able to design a framework that satisfied both her own concerns and those of the institution:

Though I was able to scrounge up some old essays and lab reports, I wouldn't say that I was pleased with the finds, mostly because there was no way to show any sort of thought progression since there were no later pieces to which the reader could compare. Despite the fact that these pieces were supposed to show my integration into other areas of academia, the artifacts often felt out of place and not at all integrated into my other work, and so I decided to separate them into their own section. But this turned out to be a happy accident, for as soon as I had stuffed away those unsatisfying pieces into their own category, the other categories followed, and I was left with a design that adequately encompassed the breadth of my experience at college: Creative Arts, Analytical and

Expository Writing, Integrative Writing, Outside Fields, and Reflections.

All of the students struggled with the institutionally driven SLOs, particularly the emphasis on thesis-driven writing that seems to pervade even the Writing Department's goals for its majors. As Cochran observed,

Yet even though I had managed to create categories that made sense of the flow of my college career, I still felt as though I was stretching to make some pieces fulfill the Writing Department's requirements. Most of the department's rubrics for what constitutes an exemplary piece of writing (and thus the kind of writing that should be in the ePortfolio) are catered to academic writing, but these rubrics often don't translate well to other genres, like personal essay or science fiction and fantasy. While these genres certainly have a driving idea behind them, you'd be hard-pressed to find a thesis and supporting evidence in a short story about displaced space jellyfish. This is ultimately why I decided to create my own ePortfolio structure; while the Writing major rubric covered a range of SLOs that certainly are necessary for a senior writing student, I didn't feel as if a portfolio structured around these SLOs fully encompassed the cross-disciplinary nature of *my* experience in college.

Reflection

The complex concerns raised by our coauthors as they piloted the ePortfolio are echoed by faculty on our campus, as Susan Adams Delaney learned during her time as chair of the Committee on College-wide Requirements (CCR), the college-wide faculty committee charged with developing procedures and reviewing policies and courses under the new Integrative Core Curriculum. While significant design and SLO decisions had been made by the time Delaney joined CCR (by CCR and by ad hoc committees such as those Silva served on), faculty continue to raise concerns as full ICC implementation completes its second year. Many share our co-researchers' concerns regarding the conflicting goals for and ownership of the ePortfolio. As Olivares queried,

Who is this really for? Is it simply a reflection on the *institution* for them to demonstrate their own worth and study how students learn and grow? Or is it for *students* to use to organize artifacts for themselves and potential employers?

Faculty likewise have raised questions about the multiple purposes for the ePortfolio, demonstrating a need for continuing conversation among all stakeholders.

In addition, our co-researchers shared concerns raised by faculty at IC and across the country regarding the impact of outcomes-based assessment on teaching and learning. Students were frustrated by the limiting nature of SLOs, which—at least as written and understood at this stage—constrain the kinds of artifacts that are valued in the ePortfolio. That is, SLOs appear to directly challenge student ownership of their learning by dictating priorities. That challenge to individual autonomy is felt by some faculty in relation to the development of courses and assignments. Faculty are, by definition, the curricular experts of any institution of higher education, charged with determining what is to be taught and how. While the emphasis on outcomes may be intended to make these decisions transparent and allow various bodies to determine whether the goals we set are being achieved and the interests of students and institutions served, many worry that outcomes-based assessment permits intrusive oversight by administrators.

Faculty, in fact, may be experiencing some of the same frustrations students express regarding assessment: that a single paper or test can never fully capture the complex process of learning. For, as faculty, drawing on their disciplinary and pedagogical expertise, design experiences that will facilitate learning, they must also craft assignments to serve as indicators of that learning—assessments. That is, faculty must craft assessable activities that will facilitate student learning *and* make that learning somehow visible. Yet, as the literature we review above makes clear, the complex messiness of learning is, at times, antithetical to the need for generalizable data. The assignments we create and which must serve as ePortfolio artifacts never fully capture the learning, serving at best as good-enough snapshots of a moment in time. Furthermore, an emphasis on assessable assignments may work to inhibit teaching and learning by shifting students' and teachers' attention away from authentic engagement to the assessments themselves.

In terms of successful ePortfolio implementation, such a shift risks turning the ePortfolio into another bureaucratic hoop to jump through, one that will be resented by students and faculty alike. As Cochran concludes, the ePortfolio should be more than “just a means of satisfying yet another checklist of requirements sent down from on-high, but a tool for analyzing your own self as a student and member of the critical world, for learning to be a discerning individual who can not only grasp scholarly ideas but implement them.” As our co-researchers make clear, including students in the process of designing ePortfolio

systems—sharing the relevant literature and listening to their feedback—will only serve to ensure such systems' relevance and viability.

Recommendations

Of course, the development of any assessment agenda in higher education is constrained by accreditation requirements and government policy. This is an essential point, because all rhetoric about student involvement and empowerment is imbricated in larger historical, political, and economic systems that mediate higher education. Despite these constraints, student involvement in large-scale assessment is possible and can occur at different stages and levels. Moreover, the extent of that involvement will vary across institutions depending on the institution's demographics and the political infrastructures that represent student needs and voices. The following recommendations are based on the different stages of ePortfolio implementation.

In the development of assessment-based standards, Driscoll and Wood (2007) contended, “students of all ages have important ideas about their own learning and are essential sources of learning outcomes” (p. 58). The authors reported that at CSU Monterey Bay (CSUMB), students were involved “at varied levels of developing outcomes, criteria, and standards” (Driscoll & Wood, 2007, p. 58). Consequently, students learned about outcomes by developing them and understood better the connections between curriculum, pedagogy, and assessment at the macro-level, across programs and departments, and at the micro-level, within individual courses. Student involvement also increased student buy-in of assessment-based standards. At CSUMB, students were invited to the table, figuratively speaking, to construct outcomes; however, students did not have the power to reject the idea of assessment-based standards outright, any more than faculty.

During the design phase of ePortfolio implementation, faculty and experienced students could create an advisory board to work as consultants. In our case, the ePortfolio committee was assigned a technician from TaskStream, who customized the ePortfolio template (the DRF) based on our institutional needs. Although Silva sought to represent student perspectives, a student advisory board would allow students to negotiate changes to the DRF. Regular use of polls or focus groups would be another option for gathering student input on design choices.

Once the ePortfolio is ready to be implemented, faculty and students can develop innovative ways to assign leadership roles to students. At Virginia Tech, Zaldivar et al. (2013) described how students developed a Student Management team that facilitated the selection process of artifacts for a Dietetics Education program. The students developed a list of options for

peers to consider while selecting artifacts that meet one of the six learning criteria. Moreover, unlike the standardized binders used with paper-based portfolios, students focused on the design of their web portfolios to market their hard work to external audiences. Students later presented at conferences and published their findings. Zaldivar et al. (2013) also stated how students introduced a sustainable model by developing a peer-mentoring program to offer guidance and technological support to those who have not started or completed their portfolios. At Virginia Tech, when the English department learned that students did not care about program assessment, they created a Student ePortfolio Leadership team that was charged with recommending what English majors would need to build successful ePortfolios. In effect, the conversation is steered from program evaluation to student needs.

In addition to student-led programs and support by students and faculty, student involvement could be codified by program administrators in the form of internships, assistantships, and independent studies. As interns or research assistants, students could review the latest learning theories in ePortfolio design and pedagogy, conduct focus groups or interviews with faculty and students, conduct surveys, develop resources or tutorials, or utilize social media to interact with peers. A paid or credit-bearing position legitimizes student involvement, allowing students to facilitate folio thinking for themselves and for their peers. Whatever avenues faculty or administrators choose in order to involve students, the process must be public, transparent, and meaningful.

Conclusion

As noted previously, Joyes et al. (2010) described student ownership of the ePortfolio as a threshold concept for faculty and administrators, following Meyer and Land (2006), who defined threshold concepts as *portals*, or ways of seeing that are essential to entering particular disciplinary communities. Such portals are necessarily challenging, since they disrupt previous ways of knowing, and often represent *troublesome knowledge*, a term Meyer and Land borrowed from Perkins (1999) to describe the resistance learners may feel to counterintuitive notions. Adler-Kassner, Majewski, and Koshnick (2012) contended that identifying threshold concepts within their respective disciplines enables instructors to scaffold student learning and encourage transfer across disciplinary contexts. However, faculty should not only identify and articulate threshold concepts for the purpose of student learning, but should also identify their own threshold concepts as educators and challenge their assumptions about student involvement in institutional assessment.

For some educators and administrators, the idea of undergraduates playing an active role in policy and pedagogy is troublesome. But why? One explanation is based on Lave and Wenger's (1990) theory of situated learning. Within academia, faculty and staff are expert practitioners within this community, and students participate as novice members in the periphery. As novices become more active within the community, they move toward the center. This makes sense in non-academic contexts in which novices move up the ranks through promotions or elections. In academia, the cultural expectation is for students to leave the community to participate as experts (or novices once again) in new communities. Thus, the idea of students making administrative or curricular decisions alongside experts of the community is unsettling to many. In paternalistic terms, the gut reaction for faculty is, "I know what's best for my students." And our intentions are genuine as we work to create learning environments that foster innovation, creativity, and student-centered learning. We demonstrate our concern for student perspectives as we poll, interview, and survey students. However, student voice-as-data versus student voice-as-active-participant represent two very different methodological approaches to student involvement. We argue that faculty and administrators should question any discomfort or reluctance to assign more authority to students in decisions related to assessment methods, policy, and pedagogy. When we take the time to include students fully in the conversation, we all benefit.

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Program-Based Assessment of Capstone ePortfolios for a Communication BA Curriculum

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This article details a case of using ePortfolios in the evaluation process and assessment of the Department of Communication at the University of Hawai'i at Mānoa. The program is guided by seven SLOs (student learning outcomes), which are demonstrable skills or abilities that students are expected to possess before receiving their degrees. The SLO framework was implemented in our department with the intent to promote effective learning through the application of a cohesive curriculum that was designed by faculty members. In 2013, we evaluated our program to assess its successes and shortfalls through ePortfolios as an assessment tool. The assessment findings noted gaps in our curriculum, along with a need to improve specific processes, such as better alignment of learning outcomes with the assessment rubric. Overall, we found that the ePortfolios and the assessment process in our senior capstone courses ensure the value of the curriculum over time and serve as agents for cultural change within the department.

Culminating experiences, such as capstone courses or senior projects and seminars, represent extraordinary learning opportunities for college students. According to Kinzie (2013), capstone courses are designed as the final “integration of educational experiences and foster transition to work or further education beyond the bachelor’s degree experience” (p. 27). In the 2014 National Survey of Student Engagement (NSSE, 2014) of 622 U.S. institutions, senior culminating experiences ranked third in student participation for high-impact educational practices, behind only service learning and field experiences. In addition, senior culminating experiences such as the capstone course provide more opportunities for diverse students (e.g., first generation students) to participate in high-impact education practices, as compared to study abroad and research with a faculty member (Kinzie, 2013).

Although capstones are not necessarily a new phenomenon in higher education, there has been a rise in their importance as culminating experiences that accomplish both student development and program assessment (Berheide, 2007; Kinzie, 2013; Rowles, Koch, Hundley, & Hamilton, 2004). For student development, capstone courses provide opportunities to reflect on their own learning throughout their college experiences. This is done primarily through experiences that increase opportunities to “connect, deepen, and generalize learning beyond the immediate setting where it occurs” (Kinzie, 2013, p. 30). For program assessment, senior capstones provide key data to faculty regarding the quality of programs and instruction (Black & Hundley, 2004, p. 3). Student artifacts produced in senior capstone courses offer a

direct, authentic, and efficient method for assessing how successful a curriculum is in addressing learning objectives (Berheide, 2007). One such artifact is the ePortfolio.

In 2010, the School of Communications revised the undergraduate curriculum to reflect important developments that were occurring in the field of communication. Our decision to revise the curriculum was threefold. First, we acknowledged the move toward greater emphasis on mediated communication technologies and strategies (Lievrouw, 2009) and on how aspects of communication are altered in a digitally networked era (Papacharissi, 2011; Pfister & Soliz, 2011). A second reason was to elevate the importance of practical engagement experiences for our students (Jenkins, Purushotma, Weigel, Clinton, & Robison, 2009). We sought to provide more educational experiences that connect to real-life work and service opportunities. The final reason was to stay within alignment of the University of Hawai'i at Mānoa's strategic plan for improving student learning outcomes. The purpose of this paper is to detail our experiences with using ePortfolios in the implementation and assessment of a capstone course based on the revision of the School of Communications curriculum at the University of Hawai'i at Mānoa. In detailing our case study, the information provided in detailing our case study will be of benefit to universities, colleges, and departments conducting program assessments with ePortfolios.

ePortfolios in Higher Education

Electronic portfolios have been employed by programs in higher education in a wide variety of instructional and assessment roles (Barrett, 2004, 2010; Sherman, 2006). Lorenzo and Ittelson (2005) defined

an electronic portfolio or ePortfolio as a “digitized collection of artifacts, including demonstrations, resources, and accomplishments that represent an individual, group, community, or organization” (p. 2). Jafari (2004) described ePortfolios as a content-management system that “facilitates the process of collecting, reflecting on, sharing, and presenting learning outcomes and other professional accomplishments via a digital medium” (p. 38). ePortfolios help to address program evaluation and accreditation concerns by providing an asset management system that facilitates a “framework for the uploading, organization, and accessing of artifacts” (Light, Chen, & Ittelson, 2012, p. 97). Clark and Eynon (2009) noted a growing interest in integrative learning focused on student experience as among the major drivers for ePortfolio use in higher education.

Unlike an academic transcript, ePortfolios provide students with the opportunity to acknowledge learning that occurs outside the classroom through co-curricular or extra-curricular experiences. These formal or informal experiences may be on or off campus and can incorporate study abroad, community service, co-ops and internships. According to Light et al. (2012), it is important to capture these significant and meaningful experiences, since students may perceive value only in formal academic work. As a result, ePortfolios serve as a “context for integration of all learning as it occurs both inside and outside the classroom, but it can also make visible the internships, jobs, study abroad, and work in the community that are often opaque to faculty instructors” (p. 86). For example, Richards-Schuster, Ruffolo, Nicoll, Distelrath, and Galura (2014) found that students who participated in a capstone class for a community action and social change program demonstrated experiences of transformative and integrative civic engagement learning outcomes in their ePortfolio program assessment. Similarly, Kerrigan and Carpenter (2013) completed an ePortfolio assessment of capstone community partnership courses at Portland State University. Their findings revealed that students had a deepened sense of social responsibility and greater efficacy to serve as an advocate for underserved populations.

A second driver in the adoption of ePortfolios is the rise of digital technologies used in higher education and the increased acknowledgment of user-generated content on the web (Clark & Eynon, 2009). The ease with which social media platforms allow students’ content to be created and shared leads to the formation of digital identities and a web presence. Ramírez (2011) described this as a hyper-inclusive *ePerformance*, in which students can potentially share and link ePortfolios to a limitless audience on the Web. A student’s digital content often becomes the first impression for future colleagues, employers, and dating

partners. ePortfolios, unlike Facebook or LinkedIn, allow students to decide, intentionally and thoughtfully, who should access their content (Jenson, 2011). Specifically, for communication majors, the ePortfolio asks students to “reflect on their construction of effective messages” (Whitfield, 2011, p. 241). According to Hoger (1998), this includes thinking critically about themselves and others as communicators and going “beyond the literal content of a message, perhaps to detect and act on subtext, to read between the lines, to consider larger contexts, to interpret innuendo, to detect strategic maneuvering, or to consider side effects” (p. 64). As opposed to Facebook, which provides a more limited view of an individual, ePortfolios represent evidence for the intersection of experiences, accomplishments, and reflections (Reynolds & Patton, 2014). In other words, the process and product of a learning ePortfolio is the “development of an intellectual identity, not a social identity” (Light et al., 2012, p. 74). However, Light et al. (2012) also noted that future technological innovations in the ePortfolio will most likely incorporate social media features such as commenting, links to Facebook or Twitter, improved multimedia capabilities, and the ability to tag artifacts or posts.

Reynolds and Patton (2014) argued that students need to “manage their digital presence by creating a digital identity that reflects their values, skills, and accomplishments” (p. 102). In this vein, some researchers suggest that the ePortfolio process does lead to gains in developing a professional, digital identity (e.g., Peet et al., 2011). On the other hand, Snider and McCarthy (2012) revealed that the rigidity of an English ePortfolio system limited the flexibility for international students to craft truly personal and professional digital identities.

A third driver is the increasing pressures for accountability and program assessment. As funding for public research universities continues to decline, programs must often demonstrate their value and effectiveness, and in some cases there are external accreditation issues. As higher education becomes increasingly focused on evidence of student learning, portfolios are seen as a valuable tool to “inform accreditation and accountability efforts” (Chen & Light, 2010, p. 1). Chen and Light emphasized that this is especially important as a means to ensure curricular coherence in contexts where students have diverse learning experiences occurring both in and out of the classroom:

As an assessment tool, the student portfolio is unique insofar as it captures evidence of student learning over time—in multiple formats and contexts—documents practice, and includes a student’s own reflection on his or her learning.

Portfolios also encourage students to represent and integrate their formal and informal learning experiences (Chen & Light, 2010, p. 1).

They also noted that learning occurs in the process of portfolio creation. At the very least, assessment results can be shared with students, parents, and prospective employers to demonstrate the strengths of a program.

A final reason is that ePortfolios provide a helpful framework for students to document and take ownership of their learning experiences. Students can easily share and connect their learning experiences with others through a digital networked environment. The ability to articulate and reflect on their achievements and demonstrate how these achievements relate to each other becomes a very useful skill for a job or graduate school interview (Light et al., 2012). Therefore, the capstone course and ePortfolio represent a new culture of learning in which students ask and answer their own questions, thereby managing their learning.

As noted earlier, we provide our experience with implementing and assessing a capstone course and ePortfolio for the Communication BA at the University of Hawai'i at Mānoa. We outline the process of creating a program assessment process for a new curriculum designed by the Communication Department at the University of Hawai'i at Mānoa. We begin with a description of the learning environment at the University and the School of Communications and discuss specific student learning outcomes (SLOs) developed to guide program assessment. We then describe the new curriculum and the role of capstone ePortfolios for assessment strategies.

Learning Environment at the University of Hawai'i and School of Communications

The University of Hawai'i at Mānoa is a land, sea, and space grant university. It is a research institution with a mission that focuses on service to the state of Hawai'i and to both national and international communities. The Mānoa campus offers 292 degree and certificate programs, bachelor's through doctorate, and has a current student population of just over 20,000 (University of Hawai'i at Mānoa, 2015). As part of the *Mānoa Strategic Plan for 2011-2015*, a primary goal is a transformative learning environment, "build[ing] on the vision of education defined as the Mānoa Experience, which provides students challenging and distinctive academic programs, innovative teaching and service, and world-class research and scholarship reflective of global perspectives and a culturally diverse island state" (University of Hawai'i at Mānoa, 2011, p. 9). Focus on a revitalized undergraduate curriculum is further being pursued by the College of Social

Sciences, which is actively working to strengthen the liberal arts curriculum (the School of Communications is part of the College of Social Sciences). In alignment with the goals of the Association of American Colleges and Universities' (AAC&U, 2015a) national effort, Liberal Education and America's Promise, the College has initiated its own strategy called Commitment to Liberal Education, focusing on high-impact educational practices such as collaborative projects, service learning, capstone courses, and learning communities.

The Department of Communication offers one of two undergraduate programs in the School of Communications, as well as an MA program. It is also one of four departments, along with Information and Computer Science, Library and Information Science, and Management Information Systems, that sponsor the Interdisciplinary PhD Program in Communication and Information Sciences. There are approximately 235 active Communication Department undergraduates, most declaring in their sophomore or junior years.

Revised Communication Curriculum

In the fall of 2008, the School of Communications hosted a two-day faculty workshop to create a revised curriculum for the Communication BA and MA programs that would more strongly prepare our graduates for productive careers and engaged citizenship in a complex, global, technology-mediated world. In particular, we sought to strengthen critical thinking skills for addressing complex, real-world situations, foster strong communication skills directed to a variety of audiences using different media, build awareness of both global and local issues, and develop the ability to work collaboratively in teams (often geographically distributed) and enable student engagement with both face-to-face and virtual communities of practice. These goals formed the basis of the student learning outcomes (SLOs), skills that we expect all of our graduates to master prior to entering the workforce or commencing graduate education. Table 1 lists the present outcomes that guide our instructional and assessment activities.

Our revised curriculum was based on our understanding of the key traditions and evolution of the Communication field, our own faculty's strengths, student interests, and feedback from alumni. We identified three separate, but interrelated, learning tracks and identified a set of common core courses for all majors and prerequisites for each track. Each track also has a focused capstone, a learning community that focuses on specific problems relevant to that content area. The AAC&U (2007) recognized capstones as one of ten high-impact educational practices that encourage deep learning. Because capstones require graduating students to create a personal project integrating what

Table 1
Communication BA Program Student Learning Outcomes (SLO)

SLO	Criterion
1	Design communication and media projects to make meaningful contributions to diverse social, professional, or academic communities, communicating effectively orally, in writing, and through digital media.
2	Reflect critically on communication products such as media productions, research and policy reports, and everyday texts.
3	Demonstrate preparedness for academic and professional careers in communication.
4	Demonstrate global awareness, including an awareness of cultures in the Hawai'i-Pacific region and issues related to cross-cultural communication.
5	Engage in collaborative problem solving, both face-to-face and in online environments.
6	Analyze the ethical dimensions of communication.
7	Critically evaluate the use of technology in communication.

they have learned, they foster reflection, holistic understanding, and transition to work or post-bachelor's education (Kinzie, 2013). The revised curriculum was submitted to the university in 2009, and the curriculum changes were initiated in the fall of 2010.

The first track, Communication in Communities, focuses on communication in social, organizational, and professional communities ranging from small groups working together face-to-face or online to large organizations communicating with international publics. Intercultural communication, international communication, organizational communication, and public relations are traditional academic areas of scholarship that inform this track. The Capstone in Communication in Communities involves project development within either local or global communities. Project options include a public relations campaign, an organizational communication audit, or a program for preparing, training, and supporting people in dealing with cultural diversity. Students explore specific project ideas in consultation with their professor and client organizations.

A second track, Media Arts, includes two production sequences, Digital Cinema and Multimedia. Digital Cinema combines the learning of single-camera production skills in narrative with documentary-style filmmaking. Pre-production, production, and postproduction filmmaking skills are constructed with essential aesthetic values that go beyond technical application to theory, criticism, and cinema history. Multimedia combines visual communication theory and design aesthetics with digital media production knowledge such as digital still photography, time-based media, and web content design to convey information. Software programs used include Photoshop, Premiere Pro and other moving image, audio sound design, and interactive content management applications. Students in the Media Arts track may choose one of two capstone courses, Digital Cinema or Multimedia.

The third track, ICTs & Policy, focuses on information and communication technologies (ICTs) and how they are shaped by, as well as influence, society. Students learn how ICTs such as the Internet, social media, mobile phones, online gaming and virtual worlds, digital video, peer-to-peer networks, and other emerging network technologies are used around the world. The Capstone Project in ICTs and Policy focuses on specific ICT and policy problems related to Hawai'i and the Asia-Pacific region. There are several project options, including: a policy analysis presenting alternatives to address an issue related to ICTs; a traditional research project related to some aspect of ICTs; a project related to ICTs employing futures research methodologies; and an applied technology project with documentation.

The capstone projects challenge students to demonstrate mastery of the communication curriculum by creating an original research project related to an area of interest within the track. A series of required courses ask students to become familiar with the research designs and methods used by communication scholars in their area of specialty; to understand the conceptual foundations, principles, practices, and traditions on which communication research is grounded; and to develop the ability to evaluate critically communication research that is presented in journals, scholarly texts, and visual media projects. The capstone projects encourage students to synthesize and reflect critically on their learning experiences, both in and out of the classroom.

The capstones also involve the creation of an ePortfolio demonstrating mastery of our SLOs. While the specific projects vary, each capstone includes written reflection and electronic artifacts created in pre-requisite courses or through capstone assignments. Assignments from the four courses required of all majors are included in the portfolio, as well as track-specific projects. Faculty were in agreement regarding

the implementation of the senior capstone project as well as ePortfolios.

Our curriculum is designed to promote authentic learning by challenging students to address “real-world, complex problems and their solutions, using role-playing exercises, problem-based activities, case studies, and participation in virtual communities of practice” (Lombardi, 2007, p. 2). Authentic learning focuses on the cultivation of portable skills by engaging students in real-world tasks and problems, focusing on ill-defined problems that require sustained investigation, and fostering metacognitive reflection. We approach problems from multiple perspectives and encourage interdisciplinary inquiry. Learning assessment is “woven seamlessly into the major task in a manner that reflects real-world evaluation processes” (Lombardi, 2007, p. 3).

Integration of the ePortfolios was done incrementally beginning in the fall of 2010. First, we began to discuss the senior portfolio/capstone requirement in our required major courses. We requested buy-in from all tenured and non-tenured faculty. However, some faculty felt threatened by or anxious about the increase in transparency through the formal documentation of learning (Danley-Scott & Scott, 2014; Light et al., 2012). Majors became familiar with the rationale for assessment and learning portfolios, and they were encouraged to save class projects for later use. Our first capstones were offered in the spring of 2012. We offered five sections (including two of Communication and Communities and one each of the other capstones), and each senior created an ePortfolio as a course requirement. These portfolios contained an original project specific to a student’s track and personal interest, as well as at least four other artifacts from Communication courses. In addition, students were also required to provide a personal statement that incorporated elements of a reflective essay (Mummalaneni, 2014). By sifting through their various assignments and integrating knowledge from different Communication courses, students reflected on their own learning processes, encouraging metacognitive and critical thinking (Barrett, 2007; Zubizarreta, 2004).

Several ePortfolio technologies were considered for the senior capstone courses. As our emphasis was on the students’ selection and creation of artifacts rather than on their learning a new technology, we decided to implement the portfolio functionality within Adobe Acrobat Pro, software that students were familiar with and that was readily available in our labs at no additional cost to learners.

As noted by Clark and Eynon (2009), there is an increased focus on interdisciplinary learning in higher education. This includes a number of links between classroom activities, professional

obligations, and students’ experiences outside of school. Our three tracks are not silos, so students are encouraged to select artifacts that reflect their interdisciplinary strengths as well as applied learning from internships or service-learning projects. In some cases, these experiences are via civic media, which offer the potential to bring together diverse communities at local, national, or global levels and encourage civic engagement among students (Rheingold, 2008; Jenkins et al., 2009). According to the National Task Force on Civic Learning and Democratic Engagement (2012), there is a vital need to “[e]xpand the number of robust, generative civic partnerships and alliances, locally, nationally, and globally to address common problems, empower people to act, strengthen communities and nations, and generate new frontiers of knowledge” (p. vi).

In addition to providing evidence for program assessment, portfolio-building is a way to communicate our SLOs with students. Used as a point of reflection, our SLOs help learners to set personal and professional goals in relation to the curriculum. We share our assessment rubric with students in order to provide clear guidelines for scaffolding learning and enhancing students’ ability to do independent work (Bereiter & Scardamalia, 1987; Vygotsky, 1978). At the same time, we view learning as a social process and emphasize the role of students as active participants in social communities who are constructing identities by engaging in communities of practice (Wenger, 2000, 2005). In the context of higher education, learning communities both link learning in communities around specific domains of interest and connect these experiences to broader communities outside of the classroom.

Implementation of the assessment process. Our SLOs describe what we expect our Communication majors to be capable of before moving into the workforce or graduate education. However, for assessment purposes, we first needed to create measurable sets of performance criteria from our SLOs that are linked to portfolio components (Williams, 2010). These were, in turn, linked to an evaluation rubric. Our rubric was modified from several designed by the AAC&U (2015b).

Our first capstones were offered in spring 2012 and represented the first full cycle of our new curriculum. We have assessed one track’s ePortfolios each year. We agreed to pilot our process by sampling one track per year for the first three years and then sampling from all tracks once the capstone portfolio process was fully integrated. This was to provide additional time for instructors to integrate the ePortfolio into their capstone courses. A panel of faculty from other tracks, prospective employers, and alumni took part in the

evaluation, using rubrics employing measurable items associated with our seven SLOs. We see this assessment panel as an opportunity to strengthen ties with the community and, in particular, civic groups, potential employers, and alumni. This also provides feedback from various stakeholders about curriculum design. In this way, we hope to create “a feedback loop that serves to update the academy on the skills required by students as they enter society” (Acosta & Liu, 2006, p.18).

In 2013, all 40 ePortfolios from the Communication in Communities track were reviewed in order to assess the degree to which we have met our program SLOs. As discussed previously, ePortfolios serve as digital content management systems. As such, case study approaches have been described in various studies in information systems (Lee, Liebenau, & DeGross, 1997). The data for our study comes from various sources: analysis of student portfolio artifacts via data collected through a Qualtrics online survey completed by the assessment panel, panel feedback about alignment with artifacts with SLOs and about the rubric, and notes from the full Communication faculty discussion about the panel’s findings. Data from all of these sources comprised our “database” to formalize the organization and analysis (Yin, 2011).

In addition to four faculty members from the Communication Department, we invited two members of our Advisory Board, alumni with high-profile jobs in our field. In fall 2013, the six-member panel met for an orientation session, and each panelist was given a packet explaining the process. It was important to remind panelists that we were assessing the B.A. program, not specific students, instructors, or classes. Packets included copies of the rubric and a CD-ROM with a subset of the portfolios. Because there were 40 portfolios, we gave one third (either 13 or 14) to each panelist, and each portfolio was assessed by two people.

As noted by Berheide (2007), a priority for capstone assessment is to minimize additional work for faculty. Since this was our first round of assessment after the curriculum change and to ease any faculty apprehension, our focus was on streamlining the assessment procedures. To this end, the assessment coordinator explained the rubric and provided helpful portfolio examples to clarify correct application and alignment of student artifacts to SLOs. In addition, since we were employing the online survey software Qualtrics to input scores, the coordinator demonstrated how to access the website and input assessment data.

Senior capstone projects. Senior capstone projects represented key artifacts for the ePortfolio, highlighting practical engagement experiences that incorporate service learning to assist Oahu nonprofits. Students worked in teams to create a business plan for those nonprofits that agreed to participate in the

capstone experience and were tasked with the following: (1) do research on the history of the organization; (2) examine their social media presence from a public relations perspective; (3) evaluate current communication plans and procedures; and (4) provide suggestions to the client for improvement. Working with real-world clients helped students to connect their learning and experiences from the Communication program to specific goals and needs by local organizations. Notable clients included the Waikiki Aquarium, Surfrider Foundation Oahu chapter, and Native Hawaiian Student Services at the University of Hawai‘i at Mānoa.

After the orientation, panelists were given two weeks to review the portfolios assigned to them and input the scores into the Qualtrics online scoresheet. Once the scores were collected, the assessment coordinator constructed a summary table showing each SLO and the distribution (percentage) of students that were given each score. This was brought to the second meeting of the panel for review. During the second meeting, we gathered additional, qualitative assessment of students’ portfolios and also highlighted areas for improvement, both within the curriculum and the assessment process. A formal assessment report was created from this process. This was shared in advance with our entire Communication faculty, and a department-wide meeting was called to discuss the curriculum. The Assessment Coordinator created a summary report and shared it with Communication faculty at an assessment meeting in November. We set an initial benchmark of 80% of students scoring as either proficient or exemplary for each SLO. Results for each SLO are presented below (Table 2).

Additionally, we investigated inter-rater consistency on the ratings given to 40 students on seven separate SLOs. Two indicators were used to represent inter-rater consistency: (1) inter-rater agreement rate, which is the percentage of identical ratings given by two raters for each SLO; and (2) inter-rater agreement within one-point difference, which is the percentage of the ratings given by two raters on each SLO that differ by one point or are identical. Each rater was supposed to give one rating for each of the seven SLOs, using student work aligned with that SLO. Each student’s work under one SLO was evaluated by two raters. This means that the total possible number of paired ratings was 40 per SLO. However, some works had missing ratings from one or two raters. Table 3 shows the number of paired ratings that we used to calculate inter-rater agreement for each SLO. It also shows the inter-rater agreement rate, and inter-rater agreement rate within one-point difference.

In general, raters gave very similar ratings. Their ratings were the same or only differed by one point over 85% of the times on student works related to all SLOs

Table 2
Percent Distribution of Assessment Scores by SLO with Percentage Achieving Benchmarks (N = 40)

SLO	Summary	Unacceptable	Marginal	Proficient	Exemplary	Benchmark
1	Effective project design/ communication*	3	8	55	35	90
2	Critical thinking	0	5	77	18	95
3	Career readiness	0	15	65	20	85
4	Global/intercultural awareness	5	18	51	26	77
5	Collaborative problem solving	3	0	69	28	97
6	Ethical deliberation	5	37	42	16	58
7	Critical evaluation of ICTs	3	18	67	13	80

Note: All values are percentages. SLO Benchmark percentages in boldface have approximated or exceeded the 80% threshold.

Table 3
Inter-Rater Consistency by Number of Paired Ratings and Percentage of Inter-Rater Agreement (N=40)

SLO	Number of paired ratings	Inter-rater agreement	
		% of agreement	% of agreement (+1 or -1 difference)
1	40	50%	95%
2	37	52%	92%
3	40	53%	90%
4	35	40%	91%
5	31	61%	87%
6	34	29%	68%
7	37	32%	89%

except for SLO 6 (68%). The strict inter-rater agreement rates were much lower, ranging between 29% on SLO 6 to 61% on SLO 5. These results indicate that raters were able to give similar ratings, but more rater training will enhance rating consistency.

To increase the quality of data, a third rater evaluated all the student works with ratings that were more than one point apart. The outlier's ratings were discarded from the analysis. In the end, there was 100% inter-rater agreement within one-point difference.

Overall, our graduates are meeting or exceeding our expectations. The two areas that we highlighted for improvement related to ethical deliberation (58%) and intercultural and global awareness (77%). We noted that some alignment issues were found between the artifacts presented and the rubric (i.e., students may have chosen works that were not ideal matches), so these data should be considered in light of this limitation. We discuss these results below.

Discussion

The revision of the Communications curriculum was motivated by recognition that our students needed additional preparation for a more complex, global,

computer-mediated world. Specifically, our goals reflect careful consideration of desired student learning outcomes where the ePortfolio can contribute to significant and meaningful teaching, learning, and assessment. In addition, we assessed the Communication program by sampling from ePortfolio submissions in the Communication and Communities track. Communication and Communities focuses on social, organizational, and professional communities, from large to small and in either face-to-face or mediated settings. Students sampled during this timeframe met or surpassed the benchmark (80%) in all but two areas. This provides evidence to support our expectation that student ePortfolios demonstrate almost all the learning outcomes in our curriculum. In a recent literature review of ePortfolio research, Bryant and Chittum (2013) concluded that there is a greater need to present original data on student outcomes through ePortfolio use. We believe our study helps to contribute to this need by assessing the ePortfolio's effect on communication students' learning outcomes.

As noted by Fitch, Peet, Reed, and Tolman (2008), our faculty "did not assume that all competencies are captured in student written assignments" (p. 47). In this regard, digital cinema and multimedia projects, student

presentations, and group work may also effectively represent student competencies but are more difficult to place as an ePortfolio artifact and to be appropriately acknowledged in the accompanying rubric. Multimedia assessment is a concern in ePortfolio research, since “the application of rubrics for assessing multimedia examples of student work collected via ePortfolios is currently being explored” (Light et al., 2012, p. 99). This is of particular importance in the communications field, where students learn and/or complete various multimedia campaign strategies, projects, and performances both in and outside of the classroom. As a result, we plan to integrate more assignments that focus on digital presence, purpose, and audience in the curriculum (Reynolds & Patton, 2014).

Policy Changes Based on the ePortfolio Assessment

The full faculty meeting held to discuss the findings of the assessment panel allowed for a great deal of informal discussion and novel idea generation. It also provided an opportunity for faculty to learn about each other’s courses and modify content to better foster student learning (e.g., identifying gaps in the curriculum or areas where strategic reinforcement of content across multiple courses would be beneficial). We used the end of the meeting to prioritize a few changes that are expected to have the greatest positive impact on student learning. These include the following:

- Introduction of a hallmark assignment for each track (as part of the required course for that track). Because the current process allows a great deal of flexibility in artifact selection, a signature hallmark assignment will allow comparisons of student learning across semesters.
- Integration of more assignments related to ethical considerations throughout the curriculum, along with an update of our curriculum map to demonstrate this competency. The curriculum map is a visual display of all courses that shows where in the curriculum the SLOs are introduced, reinforced, or mastered. This enables us to provide an appropriate sequence of learning experiences to address all SLOs
- Creating strategies to assist students/instructors in the selection of artifacts (to ensure alignment). We found that many artifacts presented as evidence were not well matched to the corresponding SLO. Thus, we focused attention on clarifying selection procedures for both faculty and students.

- Further rubric revision to enhance clarity and alignment. Our panel meeting and subsequent discussion also highlighted aspects of the rubric that panelists found problematic. For example, if there are multiple criteria at each level of the rubric, what happens if a student provides exemplary evidence for some, but not all? We addressed this by making some small changes to the rubric text and also clarifying the instructions given to the panelists.

Communicating the Results

We have several audiences for our results, and each required a different, strategic message. First, as noted above, our entire faculty received and discussed the results of the assessment panel. This led to enhanced coordination of classes and revision of content that improved the coherence of the curriculum. A second audience was our students. For prospective students, it is important to convey our results to show what they can anticipate learning in our program. We intend to feature future results on our department’s website, as part of an overall site redesign. This message is also important to share with current students, as it helps them to make sense of individual course objectives (that are linked explicitly to our SLOs). Instructors are encouraged to talk about the SLOs and our success in meeting them in courses throughout the program. A third audience is university administration, which gauges the health and success of our program based on our assessment data. We provide a summary assessment report each fall, and this is posted publicly on the Assessment Office’s website. We also presented our preliminary findings at a campus-wide poster session focused on assessment for curricular improvement. A final audience is our alumni and prospective employers, two groups that often overlap. Our strategy for reaching this group is similar to that for prospective students—we will have updated assessment results featured on our website after its redesign.

Conclusion

In this paper, we have detailed the case of our experiences with using ePortfolios in the implementation and assessment of the Communication BA in the School of Communications curriculum at the University of Hawai’i at Mānoa. We also presented the results of our pilot project integrating capstone ePortfolios for student learning and program assessment. As a field, communication is interdisciplinary, and we found that the ePortfolio can help make relational connections within our tracks, providing a more coherent learning experience that also integrates classroom experiences with real-life work

and service opportunities. We described the learning environment at the University and the School of Communications and presented the specific student learning outcomes (SLOs) that we developed to guide and assess learning outcomes. We then elaborated the process of implementing our assessment plan, and presented the results of a recent program evaluation. We found that student ePortfolios demonstrated that students met our benchmarks for five of seven learning outcomes in our curriculum. We also discussed how we used our results to strengthen our curriculum and how we conveyed our assessment results to different stakeholders. The assessment findings noted gaps in our curriculum and the need for improving specific processes, such as better alignment of learning outcomes with the assessment rubric. Overall, we found that the process ensures the value of the curriculum over time and serves as an agent for cultural change within the department.

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Acknowledgements

The authors would like to thank Cassandra Tengan, Administrative Assistant at the School of Communications, for her outstanding support related to curricular improvement and assessment. In addition, we would like to thank the Assessment Office at the University of Hawai'i at Mānoa for their guidance and expertise throughout the process.

Facilitating Interprofessional Collaboration Through ePortfolio: A Pilot Study

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Each member of the healthcare team has been trained with specific knowledge and skills. Quality patient care is dependent on the collaboration of the various healthcare professionals and their ability to work as a team. In order to be effective, interprofessional collaboration should be included in the academic preparation of each of the various disciplines. If healthcare professionals are trained to perform as interprofessional teams, taking advantage of the skills and knowledge of their teammates, this change can be implemented when these students graduate and enter their chosen profession. In order to promote interprofessional collaboration, the faculty of the health sciences department of an urban university system developed an interprofessional electronic portfolio (ePortfolio) that was used by students in registered nursing, physical therapy assistant, occupational therapy assistant, food and nutrition, and human services programs to serve as an electronic medical record. The goal of this pilot was to create an ePortfolio with tabs for each of the above healthcare disciplines. A case study on a patient with a cerebrovascular accident was created and assignments were developed by the program directors of each discipline. In order for a particular discipline to complete their assignment, the students reviewed the information and findings contained within the tabs of the other four disciplines. The ePortfolio served as an electronic medical record.

Preparing students for the ever-changing healthcare environment is challenging. It has been noted that collaboration among healthcare professionals is the key to positive patient outcomes. Each member of the healthcare team has been trained with specific knowledge and skills. As noted by the Institute of Medicine (IOM, 2003), the best place to initiate interprofessional collaboration is in the academic setting. Healthcare institutions are now being reimbursed based on patient outcomes (James, 2012). Patient outcomes may improve when healthcare professionals are trained to perform as interprofessional teams, taking advantage of the skills and knowledge of their teammates. This approach to clinical practice can be implemented when these students graduate and enter their chosen professions. To accomplish this, faculty members must demonstrate that interdisciplinary approaches to healthcare are the most advantageous for patients and their families. This is demonstrated by working with and treating colleagues in other disciplines with respect for their respective knowledge bases and scopes of practice. Students in each healthcare area should be exposed to all other disciplines during their education and training to help them optimize patient outcomes as a healthcare team.

Literature Review

Interprofessional collaboration, often referred to as interdisciplinary collaboration, has been linked to better communication between the healthcare disciplines, improved patient safety, improved patient satisfaction and most importantly, better patient outcomes (Bahnsen,

Braad, Lisby, & Sorensen, 2013; Lampiasi & Jacobs, 2010; Lepzig et al., 2002). The healthcare system is changing, and the effort to decrease length of stay is demanding effective and timely interventions from all healthcare disciplines to ensure optimal patient care (Bahnsen et al., 2013). As clinical practice is becoming increasingly more complex, team based education has become more prevalent. Interprofessional education (IPE) has been used as a strategy to enhance collaboration and communication in the pre-professional academic setting and the post-licensure professional healthcare setting (Neocleous, 2014).

IPE occurs when students learn with and from other students in different healthcare disciplines. Until recently, many pre-professional allied health education programs have been conducted in silos. Nursing, medicine, occupational therapy, physical therapy, social work, and food and nutrition programs generally focus on their discipline specific educational outcomes with a mention of teamwork. A single-discipline approach to patient care may not uncover all the patient care issues that could be revealed through an interprofessional care approach (Moyers, Finch Guthrie, Swan, & Sathe, 2014). Interprofessional education between healthcare disciplines can result in a higher quality of patient care as health professionals learn more about each other's roles and use teamwork to promote positive patient outcomes (Neocleous, 2014). In a study by Bagatell and Broggi (2014), looking at an interprofessional education module between occupational therapy and physical therapy, it was revealed that students developed an "appreciation of the importance of roles, responsibilities, teamwork, and communication, confronting professional stereotypes and increasing confidence by participating in carefully constructed IPE activities" (p. 3).

IPE encompasses more than simply having students attend the same lectures. Interprofessional

education is successful when carefully planned learning activities promote the development of skills needed for interprofessional practice (Bagatell & Broggi, 2014). These activities can take place in a variety of settings and incorporate a variety of pedagogical strategies. Students need to have experience using multidisciplinary approaches to problems and to practice prioritizing, asking questions, and finding evidenced-based solutions to patient issues (Moyers et al., 2014).

Methods

The students selected for the pilot study were a sample of convenience based on their relationships with their respective program faculty. This pilot study of an innovative classroom assignment used ePortfolio technology to approximate an EMR as well as accommodate student reflections as part of their learning experience. The ePortfolio system used at LaGuardia Community College and for this project is Digication. The Digication platform is a user-friendly, online ePortfolio that allowed students and faculty from other disciplines to share and archive their academic work and reflections (see Figure 1).

The use of ePortfolios in health science programs has become an efficient method for documenting and evaluating student learning and program outcomes (Cangelosi, 2008; Chan 2012). The ePortfolio provides the student with a vehicle that can present a compilation of their work, provide an opportunity for reflection and demonstrate clinical competence (Chan, 2012; Karsten, 2012). The advantages of an ePortfolio include the freedom of network and mobile access, increased security, data storage and backup, the ability to add digital data and multimedia artifacts, and the ability to hyperlink items to link conceptually theory and practice elements (Garrett, McPhee, & Jackson, 2013). The ePortfolio has been used in medicine, dentistry, nursing, and other health professions (Bashook, Gelula, Joshi, & Sandlow, 2008; Sandars & Murray, 2009). However, there is a paucity of information in the literature demonstrating how the ePortfolio can be used to promote interprofessional collaboration among health science programs. (Peacock, Murray, Scott, & Kelly, 2011; Peacock, Scott, Murray, 2012) As a result, the members of the health science department in a large urban community college developed an ePortfolio to facilitate interprofessional collaboration.

In order to promote interprofessional collaboration, the faculty of the health sciences department of an urban university system developed an interprofessional ePortfolio that was used by students in the registered nursing (RN), physical therapy assistant, occupational therapy assistant, food and nutrition, and human services programs to serve as an electronic medical

record (EMR). This pilot included two students from each discipline. The goal of this pilot was to create an ePortfolio with tabs for each of the above healthcare disciplines. A scenario of a simulated patient named Anna with a cerebrovascular accident (CVA) was created and assignments were developed by the program directors of each discipline. In order for a particular discipline to complete an assignment, students would have to review the information and findings that would be contained within the tabs of the other four disciplines (see Appendix). In this way, the ePortfolio served as an EMR.

The students and faculty from each program (registered nursing, physical therapy assistant, occupational therapy assistant, food and nutrition, human services) met at an orientation meeting to review the patient scenario. The patient scenario was introduced and each discipline had the opportunity to ask questions, clarify, and discuss the data, as it related to the care of “Anna” and her family. Information about the relationship between interprofessional collaboration and improved patient outcomes in the healthcare setting was presented. The students were introduced to the customized ePortfolio that was going to serve as the EMR. This ePortfolio provided students with access to the other disciplines’ information as it pertained to Anna and her family. Faculty mentors supplied appropriate documents, history and physical forms, assessment documents, teaching plans, and discharge summaries, which were uploaded into the ePortfolio using Google Docs so that the students could view each other’s work in real time. Google Docs is a word processor, a free web-based software offered by Google within its Google Drive service. Google Docs offered the students the opportunity to create and edit documents online while collaborating simultaneously with other users.

For the next two meetings, the students worked with their partners and with students from the other disciplines to complete their assignments. Faculty members were present to provide guidance and answer questions.

Results

The nursing students completed a comprehensive history and physical, along with a teaching plan and discharge summary. The RN students accessed the other disciplines’ tabs to gather information about activity restrictions, ability of the patient to complete activities of daily living (ADL), specific diet restrictions, and services needed upon discharge.

Students in the occupational therapy assistant (OTA) program had a unique opportunity to explore not only their own roles as part of an interprofessional healthcare team, but also the experience of

Figure 1
ePortfolio Screen Shot for Student Orientation

The screenshot shows the LaGuardia Community College ePortfolio interface. At the top, there is a header with the LaGuardia logo and the title "Facilitating Interprofessional Collaboration Through e-Portfolio". Below the header, there are navigation menus for "View Sections" and "View Pages". The "View Pages" menu is expanded, showing a list of pages including "Home", "Case Study", "Registered Nursing", "Physical Therapist Assistant", "Occupational Therapy Assistant", "Human Services", "Food & Nutrition", and "Student Reflections". The main content area displays a page titled "Facilitating Inter-Professional Collaboration Through e-Portfolio" with a text block discussing the challenges of preparing students for the healthcare environment and the importance of interprofessional collaboration.

collaborating with the occupational therapist (OT) in the process of the evaluation and treatment of clients in the clinical setting. The scope or practice of an OTA is directed by a treatment plan developed by a licensed occupational therapist (New York State Department of Education, 2015a). The OT faculty member provided the evaluation, long and short-term goals, and the plan of care for occupational therapy services. Once the evaluation was entered into the ePortfolio, the faculty and students met to formalize the treatment objectives and plan.

Similar to OTAs, physical therapy assistants' (PTAs) scope of practice does not allow for evaluation, testing, interpretation, planning, or modification of patient programs. Physical therapists (PT) and PTAs work together collaboratively to provide care to the patients in clinical settings, as well as outpatient facilities (New York State Department of Education, 2015b). Following a comprehensive physical therapy evaluation with a plan of care, including goals and interventions established by the physical therapist, the PTAs contributed to the plan of care and completed

PTA notes in the ePortfolio chart that would inform other disciplines of Anna's plan of care. The OTA students worked closely with PTA students to devise strategies for transfers and functional mobility.

Interprofessional collaboration between the dietetic technicians, registered (DTR), and other members of the healthcare team is woven throughout the four steps of the Nutrition Care Process (NCP). To obtain this information in an acute-care setting, the DTR reads assessments and notes written by the other disciplines in the EMR and consults with them individually and/or during interdisciplinary meetings. Utilizing the ePortfolio as an EMR simulates this experience in the academic setting. The dietetic technician program (DTP) students approached this case as a DTR would begin a comprehensive nutrition assessment—by reviewing the patient's medical record, which in this project was presented in the case study page within the ePortfolio—and documenting pertinent information on the nutrition assessment form.

The human services students were familiar with using the ePortfolio for self-reflection and as a self-

evaluation tool. While their course simulations acknowledged the collaboration with other members of the healthcare team, there was no interaction among team members. Therefore, the human services students did not know the specific interventions of nursing, physical therapy, occupational therapy, and nutrition for a patient post-stroke. Initially, the human services students felt their lack of specific medical training made it difficult for them to contribute to the care of the patient. The chart notes of their fellow students uploaded into our ePortfolio based electronic medical chart exposed the students to technical terms and data they had never seen before. The human services students understood their role as helping Anna's voice be heard within a highly complex and unfamiliar situation. Within these discussions, the other allied health students educated the human services/social work students about the technical chart information and their plan of care and, in turn, the human services student educated the patient care disciplines about the challenges of discharge planning involving a patient who is part of a language minority and has few financial resources. The result was a comprehensive discharge plan that addressed Anna's medication, dietary, and rehabilitation needs.

Discussion

The ePortfolio computer lab became a simulated nurses' station, in which each professional group charted their activities but also engaged in numerous informal discussions regarding the patient's care. Informal communication between the members of the healthcare team was essential for connecting the various professional interventions that resulted in comprehensive care for Anna and her family. While the ePortfolio acted as the EMR, the various discussions in the simulated nurses' station enabled joint planning. Upper and lower extremity range of motion and muscle strength were verified between OTA and PTA students to ensure consistency for selection of treatment methods to support bed to chair and wheelchair to toilet/tub transfers. The OTA students provided education about the patient's visual field deficit and what compensatory strategies to employ during ambulatory tasks to ensure safety. Co-treatment sessions were devised so that the OTA and PTA could work together to reinforce the rehabilitation process.

In most hospitals, communication between dietetics and nursing begins with a patient's initial screening, which is completed by the nursing staff upon the patient's admission. The latter screening includes a section for food and nutrition triggers that, if present, place a patient at high risk for malnutrition, requiring a dietetic consult and initiation of a comprehensive nutrition assessment and the NCP. The comprehensive

nutrition assessment involves far more than calculating a patient's nutrient requirements to support their physiological needs. It requires gathering data about the patient's status in a variety of areas, including but not limited to his/her physical mobility, cognitive status, ability to self-feed, chewing and swallowing function, social support and living conditions—anything that affects his/her ability to be educated, and to access, prepare, store, and consume food adequately and safely. Therefore, communication between the DTRs, nurses, occupational therapy assistants, physical therapy assistants, and the human service worker is essential.

Interprofessional communication can positively affect family education. For example, in Anna's situation the social workers coordinated meetings between the various disciplines and Anna's social support network. In this way, the social work note in the ePortfolio entry became a touchstone guiding the healthcare team to focus on Anna's social support resources (her husband, son, friends, and faith community), as well as focusing on ways to address her lack of medical insurance and financial resources through her faith community and community based social services.

Summary

As this was a pilot study of an innovative classroom activity, more study is required as it is implemented on a larger scale. Because the participating students were a sample of convenience, it is difficult to generalize from their experience to the general student population. In addition, in order to engage in successful IPE, institutional barriers in higher education must be addressed. Institutional barriers include faculty workload, classrooms that can accommodate large numbers of students, and discipline specific curricula that must be covered (Neocleous, 2014). By collaborating, interprofessional faculty develop working partnerships with other professionals, to the benefit of the students. Workload, scheduling, and the location of activities can be managed if faculty support IPE. In addition, accrediting agencies are now requiring evidence of interprofessional education within allied health programs as a criterion for accreditation (American Credentialing for the Education of Nurses, 2013).

The ePortfolio demonstrates the unification of healthcare planning for Anna and her family and highlights the students' sophistication within their area of expertise. This pilot study suggests that the use of the ePortfolio as an EMR with health sciences students in the academic setting facilitates interprofessional collaboration. Students engaged with one another with the common goal of providing Anna and her family with the best care possible. This pilot provided a creative mechanism to teach and demonstrate the

importance of interprofessional communication. The next stage of this study focuses on the impact of using the ePortfolio as an EMR in a larger classroom setting. The nursing, OTA, PTA, food and nutrition, and human services programs will be implementing interprofessional assignments using ePortfolio as part of their capstone projects for students in their last semester before graduation.

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Acknowledgements

The authors of this manuscript would like to acknowledge the support of the Center for Teaching and Learning at

LaGuardia Community College, especially Deans Bret Eynon, Howard Wach, and Roslyn Orgel. In addition, we would like to thank Thomas Rospigliosi and Mercedes Del Rosario for their support with the ePortfolio.

Author's Note

This pilot study did not require IRB approval, as the pilot was a study of the process of using the ePortfolio as an electronic medical record within a classroom setting. The aggregate student responses to participation in this pilot study were obtained and presented. Individual student responses were not documented in any presentation or publication.

Appendix
Case Study: Simulated Patient “Anna”

Cardio Vascular Accident (CVA) Case Study
“Facilitating Interdisciplinary Collaboration through ePortfolio”

Client: Mrs. Anna Lopez
Height: 63”
Weight: 175 lbs
Gender: Female
Age: 65
Setting: The Community Hospital of Queens
Ethnicity: Hispanic
Religion: Catholic
Legal: No advance directives

Past Medical History:
Hypertension x 10 years
Diabetes Type II x 4 years

Reason for hospitalization: r/o CVA

Coexisting Conditions:
Hemiplegia
Aphasia
Aphagia
Right side visual field cut (Hemianopsia)
Short term memory loss

Medications:
Lasix 40 mg by mouth per day
Toprol XL 25 mg by mouth one time a day
Metformin 500 mg by mouth two times a day
Lantus insulin 10 units sub cutaneous every night
Heparin 5,000 units intravenously two times a day

Communication:
Primary language: Spanish
Speaks and understands some English.

Socioeconomic:
Mrs. Anna Lopez is a 65-year-old woman. She has been married to Paulo Lopez for the past 40 years. Anna left her native country of Honduras 20 years ago with her husband Paulo and son Raul. They are undocumented. Anna and Paulo live in a small one bedroom second floor walk-up apartment in Woodside New York.

Anna recently lost her job as a cashier in the local grocery store due to the store closing. Paulo has worked as a short order cook in a restaurant in Manhattan for the past 19 years. He makes a decent living but does not receive medical benefits and is ineligible for Medicaid. Financially, they are experiencing some difficulties since Anna lost her job

as a cashier three months ago. Their son Raul is 30 years old. He is married with a two year old daughter. He and his family live in Miami Florida.

Mr. Lopez reports the following diet history: “low-salt diet” and “no sugar”; typical daily intake of:

Breakfast—“bowl” of Cheerios with 1 banana & whole milk; coffee with milk & Equal

Snack—“lite” Greek yogurt with fruit

Lunch—tortillas with meat or chicken and salad; water

Dinner—meat, rice & beans, some kind of vegetable; water

Snack—sugar-free ice cream or cookies; coffee with milk & Equal

Due to financial limitations, they often use canned and pre-packaged foods.

He reports that she doesn’t check blood sugar regularly—“occasionally” in the morning, but she doesn’t write it down. As far as he knows, she has had limited prior nutrition education; only when discharged from the hospital when first diagnosed with DM. He thinks she had a follow-up appointment with the Dietitian at the outpatient clinic, but didn’t go.

Client Profile

One week ago, Anna Lopez woke up feeling dizzy. Thinking it was because she had not had her breakfast yet or a side effect of her heart medication. Anna prepared herself a bowl of cereal and fruit and sat on the couch to eat her breakfast and watch the local news. Suddenly she developed a pain in her head that made her scream out for help. Frightened, she called her husband telling him what happened. Concerned, Paulo asked his boss if he could leave early so he could go home and take his wife to the doctor. He arrived home one hour later to discover his wife sitting on the floor looking dazed and confused. She vomited and was wet with urine. Rushing to her side, he asked her if she was all right. She asked him what happened and where she was – she appeared not to recognize him. Paulo immediately called 911.

Concerned Mrs. Lopez was having a CVA, the paramedics transported her to the Community Hospital of Queens.

Mrs. Lopez arrived in the ED at 11:00 a.m. She is alert but confused. She is able to state her name but does not know where she is, the date or the time. Her speech is slurred and the right side of her face and right arm and leg are flaccid. She presents with right side neglect with impaired sensation on the right side. According to the husband, Mrs. Lopez is right hand dominant. Vital signs are measured B/P 190/102, HR 100, RR 26, Temp 99, O2 SAT 95% on room air.

The healthcare team initiates a stroke protocol. A computerized tomography (CT) scan shows a large ischemic infarction. Mrs. Lopez is not a candidate for tPA therapy. She is treated with intravenous (IV) heparin. A carotid venous study is negative for carotid stenosis.

It has been one week since her admission to the hospital. Mrs. Lopez continues to have right-sided hemiplegia and is unable to walk. She reports no pain at this time but requires assistance for all bed mobility and transfers. She is having difficulty maintaining her sitting balance. She is unable to stand at this time. Her swallowing and speech are impaired and needs assistance in feeding and toileting. Current diet order “Low sodium, diabetic diet—Mechanical Soft with nectar thick liquids” S/P SLP consult—beside swallow evaluation completed; Barium swallow test scheduled. Active ROM in her right UE is impaired throughout with minimal movement in the shoulder in all planes. Elbow movement and grasp are absent. She requires assistance in dressing, grooming, and bathing. She is able to follow one step commands consistently with physical cues.

Delegation/Collaboration With:

Registered Nursing (RN)

Physical Therapy Assistant (PTA)

Occupational Therapy Assistant (OTA)

Food and Nutrition

Human Services

ePortfolios in the Workplace for Human Capital Management: A Multiple Case Study

Ronald Lievens
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This study researches whether the ePortfolio is a suitable instrument for human capital management in the business environment. The implementation of ePortfolio systems in five different organizations is analyzed. It considers whether ePortfolio implementations were successful, and relevant critical success factors were identified. For the latter purpose, a theoretical framework for analysis was compiled from the literature. The results show that the ePortfolio proved to be a useful tool for HCM purposes in two cases. The ePortfolio enabled these organizations to enhance their talent management and performance appraisal practices. Three out of five cases failed, reaching a bare minimum of their company goals and objectives. To explain these findings, the implementation processes in each of the five cases was analyzed by means of a compiled theoretical framework of critical success factors. The empirical results led to a revision of the framework, identifying eleven critical success factors. These factors revolve around linking the ePortfolio with business objectives, carefully identifying information requirements and selecting a suitable system, actively managing the implementation by appropriate and dedicated staff throughout the organization, and ensuring that employees have ownership over their ePortfolio profiles.

As a result of contemporary shifts in worker demographics and structural changes to the nature of work, there is a need for firms to prepare and utilize their workforce in an appropriate manner. Therefore, in recent years human resource management (HRM) scholars have paid increasing attention to the management of human capital (HCM) in organizations throughout the entire employee life cycle, with a growing emphasis on learning and development, performance and incentive management, employee retention, workforce planning, and worker redeployment (Schweyer, 2010).

Despite often-heard claims that human capital is the most valuable resource of an organization, firms that proactively act on this notion by implementing HCM processes (e.g., strategic workforce planning) are few and far between (Huber, 2012). In 2013, CedarCrestone's 16th Annual Human Resources (HR) Systems Survey revealed that only 14% of respondents reported adoption of such processes (Martin, 2013). This can be explained by the fact that the HR profession is still developing an acquaintance with evidence-based management and by a lack of research on how to utilize existing information systems accurately and effectively for this purpose (Huber, 2012). Furthermore, the management of human capital is an intricate and complex process (Schweyer, 2010) that depends on the gathering and analysis of reliable, qualitative data about an organization's workforce. In the process of HCM, the gathering and interpretation of qualitative (e.g., competences-based information) and quantitative data (e.g., turnover rates) are vital (Pfeffer & Sutton, 2006; Rousseau, 2006; Westphalen, 1999). Empirical research has shown, however, that many organizations struggle to gather qualitative data on

employee performance, potential, and competences (Lukaszewski, Stone, & Stone-Romero, 2008).

Barker (2003) proposed that ePortfolios are a feasible instrument in this process, due to their close linkage with the tracking and development of human capital, lifelong learning, and the assessment of prior learning by gathering qualitative data about individuals. ePortfolios possess unique properties that differentiate them from more commonly used human resource information systems. As a digital professional profile of an employee, an ePortfolio enables the capturing and comparison of qualitative data regarding the skill level and competences of employees, their ambitions, developmental potential, and career expectations (JISC, 2009; Smith, 1996; Woodbury, Addams, & Neal, 2009). Furthermore, in current times multiple career shifts are increasingly common. Therefore, there is a need for a so-called "career-passport," which professionals carry with them as they move from one setting to another (Clark & Eynon, 2009). The ePortfolio can facilitate this.

To this day, the ePortfolio has not been researched empirically in the organizational setting. The concept, which originated in the educational context, has however been argued to be suitable for professional purposes by many scholars in the ePortfolio domain (Balaban, Divjak, & Mu, 2011; Cambridge, 2010; Flanigan & Amirian, 2006; Greenberg, 2004; Jafari & Greenberg, 2003; JISC, 2009; Tosh & Werdmuller, 2004). This study aims to substantiate these claims by evaluating empirically the implementation of ePortfolio systems in organizations in an innovative three-year program called "Let's Connect," which took place from early 2012 until late 2014. The program aimed at enhancing the mobility of workers, both within and across organizations, by introducing an ePortfolio.

The aim of this research is to investigate the feasibility of ePortfolio use in the workplace. The objectives include establishing whether the implementations were successful and identifying the critical success factors. In order to achieve the research objectives, the following research questions were formulated:

1. To what extent were the ePortfolio implementations successful?
2. What critical success factors are associated with the implementation of an ePortfolio system in organizations?

Human Resource Information Systems

A *human resource information system* is a “technology-based system used to acquire, store, manipulate, analyze, retrieve, and distribute pertinent information regarding an organization’s human resources” (Tannenbaum, 1990, p. 27). Examples of such systems include SAP and Oracle. A human resource information system comprises a database of performance-related information (Kavanagh & Thite, 2009; Kovach & Cathcart, 1999). The information relates to such aspects as recruitment, training and development, performance evaluations, and turnover rates (DeSimone, Werner, & Harris, 2002). Utilizing this information, organizations can effectively manage, develop, and deploy their human capital (Bassett, Campbell, & Licciardi, 2003; Lawler & Mohrman, 2004). Therefore, human resource information systems have been deemed critical contemporary HRM tools that enable organizations to transform data into critical business information (Marler & Floyd, 2009).

ePortfolio

ePortfolios are “personalized Web-based collections of work, responses to work, and reflections that are used to demonstrate key skills and accomplishments for a variety of contexts and time periods” (Lorenzo & Ittelson, 2005, p. 2). The information in an ePortfolio typically relates to work experience, ambitions, and acquired and developed competences and may include assessment results, research papers, certificates, reports on projects and teamwork, or internships (Flanigan & Amirian, 2006; Greenberg, 2004; Tosh & Werdmuller, 2004).

The ePortfolio is a broad concept with a wide array of definitions and described purposes. This is the result of two conflicting paradigms that surround the ePortfolio concept: the constructivist and positivist approaches. The constructivist approach emphasizes the learner’s perspective and the importance of reflection and considers the ePortfolio as

a learning environment in which the learner constructs meaning. This learning environment as given shape through the process of portfolio construction assumes that meaning varies across individuals, over time, and with purpose. The portfolio presents process, a record of the processes associated with learning itself; thus a summation of individual portfolios would be too complex for normative description. (Paulson & Paulson, 1994, p. 36)

The positivist approach, on the other hand, considers the ePortfolio a tool to assess externally defined learning outcomes and “assumes that meaning is constant across users, contexts, and purposes” (Paulson & Paulson, 1994, p. 36). The latter approach was central to the ePortfolio implementations in the Let’s Connect program, due to the necessary evaluations of employee performance by certain organizational standards.

ePortfolio Implementations

While there is no existing framework for the evaluation of ePortfolio implementations in the workplace, there is a substantial amount of research towards ePortfolio implementations within educational institutes. The Learning Sciences Research Institute at Nottingham University developed the ePortfolio Maturity Model in 2007 to aid the monitoring of implementations (Hartnell-Young et al., 2007). This model can be found in Appendix A.

The ePortfolio Maturity Model (EMM) consists of factors that reflect the readiness of an educational organization to engage effectively in ePortfolio use. Such a model does not exist for ePortfolio use in the workplace. However, there has been substantial research towards the implementation of HR information systems in the workplace that can be used to complement this model. In the literature, this is better known as the critical success factors approach. One of the most cited definitions was introduced by Rockart (1979), who stated that critical success factors are “the limited number of areas in which results, if they are satisfactory, will ensure successful competitive performance for the organization” (p. 85). Today, information system experts increasingly use these factors to support the planning process (Esteves, 2004). The eight critical success factors identified in by Rockart and Delong (1988) have been reconfirmed by various other researchers (e.g., Bird, 1991; McBride, 1997; Paller & Laska, 1990; Watson, Rainer, & Koh, 1995). Poon and Wagner (2001) identified two additional factors from the literature, which resulted in the Executive Information System Success Factors (ESF) framework, as presented in Appendix B.

Method

This research was conducted in accordance with the interpretivist paradigm and followed a two-stage qualitative approach. First, a critical literature review was conducted to compile a theoretical research framework consisting of indicators of system success and critical success factors that could be used as a basis to evaluate the ePortfolio implementations. In the second stage, the critical success factors in this framework were empirically verified in five case studies using qualitative research methods.

Participants

The five organizations studied include five private, commercial businesses in the southeast region of The Netherlands (also known as the Brainport region). These businesses voluntarily enrolled in the project in early 2012 and completed the project late in 2014. They were provided with an ePortfolio system of their choice, free of charge, to experiment with. Table 1 provides a brief overview of their company size and number of participants in the pilot. The defined HCM goals and objectives and their outcomes for each of the five cases are presented in Appendix C.

Materials and Procedure

Stage 1. To establish whether the implementations of ePortfolio systems in the Let's Connect project were successful, the evaluation criteria have to be decided on. The literature on executive information systems provides a set of criteria that has been thoroughly researched by various scholars. In a study by Poon and Wagner (2001), five main criteria were distilled from the literature:

1. Access: the system is made available and users are given access to the system;
2. Use: the system is used by the intended users;
3. Satisfaction: users are satisfied with the system;
4. Positive impact: the system has positive impact on the executives and the organization;
5. Diffusion: the system tends to spread.

To contextualize and explain these outcomes, a systematic analysis of the implementation process is required. First, Poon and Wagner's (2001) five criteria are used to establish the degree of success in implementation and the suitability of ePortfolios for the workplace. Subsequently, to contextualize these findings and to explain success and failure, a framework of critical success factors is compiled. This framework consists of a combination of the EMM and

ESF frameworks. Together, the two models share a degree of complementarity. The EMM model addresses factors that represent the unique characteristics of the ePortfolio by emphasizing such aspects as interoperability, autonomy in ePortfolio use, and the ownership of data. Furthermore, it consists of more generic factors related to the hosting institution and staff. These generic factors are covered more elaborately in the ESF framework, which has been validated through decades of empirical research. The two models' frameworks were compared side by side, identifying unique and overlapping factors. This comparison resulted in the Combined Critical Success Factors (CSF) framework, as depicted in Table 2. The left and right columns include 19 unique factors from both sources, while nine overlapping factors are presented in the middle column. Factors from the EMM framework, which was originally designed for the educational context, have been reworded, where appropriate, to represent the workplace.

Stage 2. To identify the critical success factors of ePortfolio implementations, five case studies were analyzed. After establishing whether an implementation was successful, the critical success factors determining success and failure were analyzed through primary and secondary data collection. To facilitate data triangulation, the questions were answered through an analysis of different sources, including project documentation (e.g., presentations, field notes, and meeting reports) and through semi-structured interviews conducted at the beginning and final stages of the project. The interviews were held with HR-personnel involved in the implementation process and with employees using the ePortfolio. To answer the first research question, the fulfilment of the five main success criteria was established by seeking answers to such questions as "Does the organization intend to continue with the ePortfolio after the pilot phase?" (representing diffusion) and "To what extent were pre-defined HCM goals and objectives reached?" (representing positive impact). To determine the critical success factors in all cases, all factors from the compiled framework are discussed as themes in a semi-structured interview. Examples of interview questions included "To what extent did you define system requirements for the ePortfolio?" and "In your view, does the ePortfolio belong to the organization or the employee?" In the search for patterns, the similarities and differences about relationships within the data are examined. Cross-case analysis is conducted to examine the identified CSFs.

The method involves a content analysis to corroborate the compiled CSF framework and make adjustments where appropriate. Content analysis entails a systematic, rigorous examination of data that results in discerning themes (Marsh & White, 2006). As a

Table 1
Participating Pilot Organizations

	Case studies				
	C1	C2	C3	C4	C5
Sector of industry	Materials	Industrial	Materials	Information Technology	Materials
Company size (# of employees)	500+	500+	100-250	100-250	0-10
Participants	70	40	58	20	7

Table 2
Critical Success Factors Framework for ePortfolio Implementations

Critical success factor	Source		Overlap
	ESF	EMM	
Committed and informed executive sponsor	X		
Appropriate supporting staff	X	X	Staff ICT Skills Staff engagement Staff providing feedback
Operating sponsor	X		
Appropriate technology	X	X	Usability Reusability
Management of data	X	X	Connectivity Interoperability
Clear link to business objectives	X	X	ICT policy ePortfolio policy
Management of organizational resistance	X		
Management of system evolution and spread	X		
Evolutionary development methodology	X		
Carefully defined information and system requirements	X		
Employee autonomy in learning		X	
Employee autonomy in ePortfolio use		X	
Electronic links to the organization		X	
Access to ePortfolio		X	
Employees as active users		X	
Employees as seekers of feedback		X	
Engagement of employees		X	
Institutional embedding		X	
ePortfolio ownership		X	

Note. (Hartnell-Young et al., 2007; Poon & Wagner, 2001)

result, a redefined CSF framework for ePortfolio implementations in organizations was developed.

Results and Discussion

ePortfolio Success

Overall, the organizations experienced varying success rates in implementing the ePortfolio. Despite the fact that the ePortfolio was available without restrictions in most organizations in terms of accessibility, the system failed in all other areas in three out of five organizations (see Table 3).

These areas are discussed in detail below for each case study.

Case 1. The implementation was a failure in Case 1 (C1). In terms of accessibility, participants indicated that they had no problems accessing the system. The ePortfolio, over the course of a year, was used once by all participating employees. They completed their profile and did a standard assessment. Staff members who were responsible for on-the-job learning with the ePortfolio did not use or promote the system. Reported satisfaction with the ePortfolio was, however, high among all participating employees. They indicated that it could be a very useful tool for their professional

Table 3
Pilot Outcomes

	Case Studies				
	C1	C2	C3	C4	C5
Access	±	✓	✓	✓	✓
Use	×	×	±	±	×
Satisfaction	×	×	✓	✓	×
Positive impact	×	×	±	✓	×
Diffusion	×	×	✓	✓	×
Overall	×	×	✓	✓	×

Note. ✓ = Successful, ± = Acceptable, × = Unsuccessful.

development and careers and wished that the organization had made better arrangements to ensure a proper implementation. The ePortfolio ultimately did not have a positive impact; none of the HCM goals were reached, and only one of the six objectives was partially reached. Consequently, the ePortfolio use did not spread, and the system has been discontinued.

Case 2. The implementation was a failure in Case 2 (C2). In terms of accessibility, participants indicated that they had no problems accessing the system. The ePortfolio, over the course of 2 years, was used once by all participants, who completed their ePortfolio profile and a personality test. However, there was no follow-up to this by the organization, despite some employees showing interest in the system. Reported satisfaction levels with the ePortfolio were low. Some workers indicated that it could be a useful tool for their professional development and careers and thought of the ePortfolio as complementary to their LinkedIn profile due to the personality test and assessments, if it were used actively in the organization. Others employees were skeptical of the ePortfolio and feared that the contents would be used in lay-off procedures. In addition, the HR manager was not satisfied with the quality of the assessments included in the system. The ePortfolio did ultimately not have a positive impact; none of the HCM goals or objectives were reached. Consequently, the ePortfolio use did not spread and the system has been discontinued.

Case 3. The implementation was a success in Case 3 (C3). In terms of accessibility, participants indicated that they had no problems accessing the system. All participants used the ePortfolio once. Reported satisfaction with the ePortfolio was high among all participating employees. They indicated that it was convenient to have the system integrated into the HR system they were already using. Consequently, they had a single-access point for all employment-related matters such as salary slips, completed training, and developed competences. The ePortfolio did have a positive impact; the two HCM goals were partially reached, as the process was on-going when this present paper was

published. Both the HR manager and the participating employees believed that the introduction of the system contributed to talent management and mobility, and that effects will materialize in the long run. The organization has decided to use the ePortfolio as an inherent part of future performance appraisals; as such, the system has spread across the organization. Four of the eight objectives were reached; the remaining four are in progress. The organization decided to continue ePortfolio use in the organization after the project.

Case 4. The implementation was a success in Case 4 (C4). In terms of accessibility, all participants indicated that they had no problems accessing the system. The ePortfolio was used multiple times by all participants, who had feedback sessions with supervisors. Reported satisfaction with the ePortfolio was high among all participants. Both supervisors and employees indicated that the ePortfolio was extremely useful as a basis for performance appraisals. The HR manager was satisfied that they managed to structure the ePortfolio in accordance with existing competence profiles in the organization, which can enable the organization to make a quick scan of all present competences in the organization. The organization and its employees were positive that the ePortfolio will reach the HCM goals across the entire organization once its development is complete, which is illustrative of the positive impact of the ePortfolio. Furthermore, efforts are currently being made to collaborate with a local university to achieve consensus on a fixed set of competences that can then foster the recruitment of graduates through standardized competence profiles. Their ePortfolio system will then function as a linchpin between the organization and university. Three of six objectives were reached; the remaining three are in progress. The organization is continuing ePortfolio use after the project.

Case 5. The implementation was a failure in Case 5 (C5). In terms of accessibility, there were no experienced issues. The ePortfolio system was used once during a brief introduction by the HR manager. Users were not satisfied with the system and indicated

they were not interested in using it. The ePortfolio did not have a positive impact in the organization, none of the HCM goals was reached, and only one out of four objectives was accomplished (i.e., describing relevant competences for various functions). The organization decided to discontinue ePortfolio use.

Implementation

To contextualize these findings and to identify critical success factors that impacted success of implementation, all factors from the CSF framework were analyzed for each case study and compared across all cases (see Table 4). First, constant factors across all cases are discussed, followed by factors in which there were notable differences between successful (C3, C4) and unsuccessful (C1, C2, C5) cases.

Constant factors across successful and failed cases. In both successful and failed implementations, the moderate levels of employee autonomy in learning and ePortfolio use seemed to have been a constant. All organizations indicated that employees were provided with a certain degree of freedom in defining professional learning goals and using the ePortfolio, as long as these goals and activities were relevant to the function in which they were employed or to which they were aspiring to grow. The nature and contents of the assessments were dictated by the organization. As one HR manager stated, “We want to use the ePortfolio for performance appraisals; therefore, the ePortfolio contents and use must be related to competences which we find relevant for a particular function” (C3). This is necessary because the ability to benchmark qualitative ePortfolio data is inherent to nearly all formulated HCM goals and objectives, in line with the positivist perspective on ePortfolios (in which externally defined learning outcomes are crucial). Therefore, these factors can be considered irrelevant, as they are inherent to the workplace and human capital management. This factor originates from the ePortfolio Maturity Model, which was tailored to the educational setting and, as such, places more emphasis on the constructivist perspective (in which ePortfolio meaning is mostly limited to the individual).

Furthermore, in all five cases the electronic links to the organization and access to the ePortfolio were mostly unhindered. The former is unsurprising, given the increasingly interconnected nature of the workplace through cloud-based applications; therefore, this factor can be considered outdated and irrelevant. As for access to the system, a few minor complications were reported with regards to login problems in the early phase of the pilot; however, these were resolved quickly, and

participants were all able to access the ePortfolio whenever they wished to do so.

A striking observation is that all five organizations suffered from the lack of a committed and informed executive sponsor. This is illustrated by the following quotes during the interviews with HR managers: “Executive management support merely consists of them allowing me to spend time on it” (C1); “[The company executive] never has time to discuss this project with me; he initiated the project and delegated it to me” (C3); and, “The company CEO made arrangements to participate in this project and handed it over to [the HR department]” (C4). As a result, the responsibility for implementation rested with the supporting staff and operating sponsor in all organizations; however, in C5, due to the small size of the company, one person fulfilled all three roles. It seems that while the executives of the organizations were in favor of the project, their actual involvement was relatively hands-off. Arguably, this can be attributed to the subsidy-driven nature of the project, and the lesser urgency compared to intrinsic business needs. Three managers (C1, C2, C5) similarly stated that they did not have time for it now, as the business had more urgent priorities.

Factors fulfilled in successful cases and unfulfilled in failures. The presence of active information system (IS) support and an operating sponsor were two of 13 factors in which there are distinct differences between failed (C1, C2, C5) and successful (C3, C4) cases. In the failed instances, both the HR manager and the employees reported that the ePortfolio was not actively managed by the organization. In C1, employees indicated that the HR manager briefly introduced the ePortfolio to them, but that there was no follow-up, causing the participants to lose interest. In this case, the HR manager himself also admitted that the ePortfolio was low on his priority list due to the effects of the economic crisis on his organization and due to the fact that there was no operating sponsor who could manage the implementation. One important objective here was to strengthen the relationship with the in-house educational provider through the ePortfolio; in the interview, however, the manager stated that he gave up on this after the “educational institute didn’t call me back about it.” Confronted with the lack of progress the organization was making throughout the project, the manager insisted that it was “a complex project, which requires more time.”

In C2, the HR manager indicated that she had lost interest due to an interplay of other factors: (a) promises about the ePortfolio’s functions were not lived up to, and the quality of standard assessments was disappointing (appropriate technology); (b) employees were skeptical about the organization’s intentions with the ePortfolio (managing organizational resistance); and (c) other staff members were struggling with the

Table 4
Critical Success Factors Outcomes

Critical success factor	Case studies				
	C1	C2	C3	C4	C5
Committed and informed executive sponsor	x	x	x	x	x
Appropriate supporting staff	x	x	✓	✓	±
Operating sponsor	x	x	±	✓	x
Appropriate technology	✓	x	✓	✓	x
Management of data	x	x	✓	✓	x
Clear link to business objectives	x	x	✓	✓	x
Management of organizational resistance	x	x	✓	✓	x
Management of system evolution and spread	x	x	✓	✓	x
Evolutionary development methodology	x	x	✓	✓	x
Carefully defined information and system requirements	x	x	✓	✓	x
Employee autonomy in learning	±	±	±	±	±
Employee autonomy in ePortfolio use	±	±	±	±	±
Electronic links to the organization	✓	✓	✓	✓	✓
Access to ePortfolio	±	✓	✓	✓	✓
Employees as active users	x	x	✓	✓	x
Employees as seekers of feedback	x	x	✓	✓	x
Engagement of employees	x	x	✓	✓	x
Institutional embedding	x	x	✓	✓	x
ePortfolio ownership	±	x	✓	✓	✓

Note. ✓ = Successful, ± = Acceptable, x = Unsuccessful.

concept of competences (managing organizational resistance). In this case, an operating sponsor was also lacking. In C5, the company executive (also acting as IS support and operating sponsor), did not have sufficient time for the pilot: “In a small company such as mine, you either need someone who is fully dedicated to the implementation or a system which is instantly ready to use; I simply did not have the time.”

In C3, the combined role of IS support staff and operating sponsor also rested with the HR manager; however, she did manage to accomplish a partially successful implementation. She indicated that although it was tough to handle the entire project, she systematically (albeit slowly) developed the system in accordance with the organization’s needs, gathering support by frequently discussing the project with employees and senior management. In an interview, she stated that the project would have developed more quickly if it had not rested completely on her shoulders. In C4, the role of IS support rested with the HR manager, and another HR staff member functioned as operating sponsor. They also held frequent meetings with employees and senior management to ensure that the ePortfolio was aligned with organizational needs. In both cases, this method of evolutionary development resulted in an absence of organizational resistance.

The management of the system’s evolution and spread, in which the ePortfolio is tailored to the needs of the organization and its users, was lacking in the

failed cases. In C1 and C2, employees indicated that no efforts were made by the organization to cater to their needs and that their feedback was not acted upon. In C2, an employee stated, “we thought the project was finalized 2 years ago; we did not hear anything from the organization since the system was introduced.” Similarly, in the case of C1, employees were in agreement that the organization’s efforts were “lackluster.” In C5, the CEO also struggled to develop the ePortfolio, despite being aided by an additionally hired HR consultant halfway through the pilot. In the two successful cases, the operating sponsor held meetings with supervisors and employees to develop further the system. This resulted in C3 being successful by embedding the ePortfolio in the company’s existing HR software, and C4 switching to a different ePortfolio supplier after employees and staff complained about the quality of standard assessments of the previous system. For example, one staff member stated, “They were similar in quality to those you find in a magazine at the dentist’s office.”

In the three failed cases, there was a lot of unmanaged resistance against the ePortfolio implementation. In C1, employees were enthusiastic about the system’s possibilities; however, they expressed dissatisfaction with the way the system was introduced and distrust in the organization’s intentions. They indicated that an HR manager briefly introduced the ePortfolio to them but that there was no follow-up,

which led to the participants losing interest. Furthermore, participants seemed to be wary of the organization's intentions. They expressed a fear of being monitored and thought the ePortfolio could be used against them in the case of lay-offs. It also became apparent that employees had to request permission from the HR manager to share their ePortfolio contents with others. This reinforced their suspicions about being monitored and their reserved attitude. Furthermore, staff members responsible for on-the-job training were known to resist the ePortfolio system, and the HR manager did not address the issue.

In C2, there also was a group of employees who feared that ePortfolio contents would be used in lay-off procedures. In this respect, the organization admitted that the introduction of the ePortfolio system and its purpose to this group was flawed. This occurred in the beginning of the project and was reported to have impacted the reputation of the project through word of mouth. Furthermore, the HR manager was dissatisfied with the purchased ePortfolio system (a decision made by the corporate executive), which did not meet her expectations. She felt that the quality of the assessments included was sub-par and that a lot of work and time were required to adapt the ePortfolio to the organization. In C5, this resistance was caused by employees uninterested in the system, who stated that they did not understand what it was about and why it was needed. The company executive admitted that he had failed to gather support for the system. He attributed this to a lack of time, which resulted in a slow customization of the system, tailored to the company's needs (a lack of evolutionary development). In addition, he said that in hindsight, he wished he had considered other ePortfolio systems to compare customization options and user-friendliness, which he felt were lacking in his system.

The choice of an appropriate ePortfolio system turned out to be of crucial importance in three other cases. In C2, the ePortfolio was considered unsuitable to meet the company's HCM goals and objectives. The competence assessments lacked substance and were "more suitable for orientation purposes rather than evidence-based decision making." The HR manager said, "I feel like this ePortfolio system prioritized the technology over the quality of the competence assessments; it is not suitable for our needs." The HR manager in C4 had a similar stance but took efforts to switch to a more appropriate system. In these cases, the factor "management of data" was of great importance; the systems lacked the ability to provide access to reliable data on the employees' competences. Furthermore, the ePortfolios lacked sophisticated importing and exporting functionalities, which resulted in organizations being unable to exchange competence data with educational institutes. This can also be

explained by the highly contextual nature of competences, which hindered standardization. The existing IMS standard and its derivatives do not facilitate the exchange of competence data. There are developments in this field, such as O*NET in the United States (including descriptions of competences related to various occupations) and the European Qualifications Framework; however, these have not yet been applied to an ePortfolio infrastructure. C4 is continuing to pursue this after the project by using an ePortfolio system that connects the company with a local university. This idea is similar to an Italian ePortfolio platform connecting the workplace and education, AlmaLaurea, which consists of a database of student ePortfolios from which companies can recruit graduates. C4 is making efforts also to include standardized competences to the platform they envisage.

In C3, no separate ePortfolio system was purchased; instead, the existing HR tool was customized to include desired ePortfolio functionalities (competence profiles of each employee). Only in C1, the system's choice did not have a significant impact.

In the two successful cases, there was a clear link between the ePortfolio and the business objectives. In C3, the HR manager stated, "Now that the ePortfolio's development is complete and that all our company's competence profiles are included, we can use the profiles of our employees as input for performance appraisals." In C4, the ePortfolio's added value also stemmed from the system allowing the organization to benchmark employees (in terms of their competences) and to start using the system for recruitment purposes in cooperation with a local university. The management of data was inherent to the successful linkage of the ePortfolio with business objectives. In turn, the successful management of data was dependent on a careful definition of information and system requirements. While in a broad sense all five organizations defined HCM goals and objectives, only in the two successful cases were efforts made to identify the exact information required from the ePortfolio to fulfill these. In C3 and C4, relevant competences for each participating function in the pilot were identified and described. In addition, meetings were held to identify the needs of all staff members that would be using the system. This information was crucial for customizing the ePortfolio in a manner that allowed it to be implemented effectively.

In two failed cases, ePortfolio ownership had a detrimental effect on the evolution and spread of the system. In C1, employees reported that they had to ask permission from their supervisor to share ePortfolio contents with others. Therefore, they felt that the system was only being used to monitor the employees and that they had limited freedom in the way it could be

used. The HR manager was unaware of this, indicating that this was an incorrect interpretation by the employees; however, the manager did not undertake actions to take away these concerns. In C2, the company executives expressed worry that the ePortfolio could be harmful for the organization, as it could facilitate the headhunting of talented employees by other organizations. Therefore, they insisted that ePortfolio ownership rested with the organization and that employees would be limited in sharing their profile.

The institutional embedding of, engagement with, and use of the ePortfolio by employees (e.g., activity and seeking feedback) was negative in the failed cases and positive in the successful ones (except for C5, in which case the company executive struggled to explain what the system was and why it was being introduced). Employees were unanimously positive about the concept of ePortfolio, but dependent on the implementation by senior management because this was a top-down organizational process. In each of the five cases, a combination of the factors discussed above resulted in a lack of use and engagement by the employees and in a lack of institutional embedding. As such, they were not of critical importance in these cases and can be considered as outcome measures rather than conditions for the implementation.

Judging by the outcomes, ePortfolio implementations in organizations are likely to be a best practice rather than a best fit. The processes show significant similarities in terms of factors that made a difference between success and failure. In each successful case, a different interplay of a constant set of factors made a difference. The successful cases demonstrated that linking the ePortfolio to business objectives by using appropriate technology, carefully defined information requirements, and an evolutionary development methodology with committed and informed staff led to a successful implementation. The failed cases suffered from a lack of informed and committed staff, which in turn resulted in a lack of information requirements, poor management of organizational resistance, and inappropriate technology being used. Furthermore, the cases in which ePortfolio ownership mostly remained with the employees led to an uptake in use and engagement. C5 was the least successful case, which can be explained by the relatively small company size compared to the other cases and the lack of HR expertise to implement a new information system. These observations result in the revised framework of critical success factors for ePortfolio implementations in organizations, as depicted in Table 5.

Limitations

One limitation of this study is related to generalizability. The sample size was relatively small. Furthermore, there were large differences between the five organizations. They all varied in company size,

operated in different sectors, and faced different external pressures (e.g., the recession) impacting the time and resources allocated to this project. These contextual factors may have accounted for the different outcomes. However, despite these differences the CSFs identified shared a large degree of similarity across all cases and as such we have a deepened understanding of ePortfolio applications in the workplace.

Another limitation of this study is the external financial incentive for participation. All costs related to the purchase and use of ePortfolio systems were covered by the project. It is a possibility that implementation outcomes, as well as the accomplishment of critical success factors were affected by this.

Conclusion

This study aimed to investigate whether the ePortfolio is a suitable instrument for the workplace. This was researched by an analysis of a three-year case study that took place in The Netherlands. While the ePortfolio did not fully realize its potential in terms of facilitating mobility and life-long-learning, the two successful cases show that the ePortfolio can be a valuable instrument in the process of internal human capital management. In both cases, the system facilitated the gathering of qualitative data on competence mastery of employees that can be used for performance appraisals and to identify talented workers by comparing their competence profiles, in line with the theoretical assumptions on the utility of the ePortfolio. Organizations failed to exchange ePortfolio data with educational institutes to foster recruitment. This can be explained by the fact that the ePortfolios were used in isolation in the organizations, and that the import and export functionalities suffer from a lack of standardization.

Three out of the five cases failed to implement the ePortfolio, which is illustrative of the complexity that surrounds the implementation of such an information system. The only constant positive success indicator across all five cases was providing access to the system. To explain these findings, an analysis of the implementation processes in each of the five cases by means of a compiled theoretical framework of CSFs followed. This resulted in the identification of 11 critical success factors that impacted the ePortfolio implementations in this case study (Table 5). These factors can be summarized as (a) linking the ePortfolio with business objectives, (b) carefully identifying information requirements and selecting a suitable system, (c) actively managing the implementation by appropriate and dedicated staff throughout the organization, and (d) ensuring the employees have ownership over their ePortfolio profiles. In all five

Table 5
Critical Success Factors Framework for ePortfolio Implementations in Organizations

Critical success factor	
Committed and informed executive sponsor	Management of organizational resistance
Appropriate supporting staff	Management of system evolution and spread
Operating sponsor	Evolutionary development methodology
Appropriate technology	Carefully defined information and system requirements
Management of data	ePortfolio ownership
Clear link to business objectives	

cases, a combination of these factors determined failure or success.

This study contributed to the literature on ePortfolio use by investigating empirically theoretical claims about the utility of the concept in the workplace. This further advances the knowledge on the different applications of the concept. Furthermore, it provides organizations with a framework of critical success factor that can be used to plan an effective ePortfolio implementation. The Let's Connect program ultimately aimed to enhance mobility of workers. The research reveals that the ePortfolio's suitability for usage across different contexts is limited, due to the inability to exchange qualitative data in a uniform manner. This suggests that the ePortfolio can only perform effectively in a platform-function in which data is interpretable and exchangeable by all parties. Such a platform could not be realized within the timeframe of the Let's Connect program. Future research could investigate the effects of ePortfolio use in such a platform-function (e.g., AlmaLaurea), in which the exchange of qualitative data across different contexts takes place. Individuals and organizations that are part of such a platform could be followed to establish whether the ePortfolio fosters mobility.

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Appendix A
The ePortfolio Maturity Model

Maturity factor	Description
ePortfolio Policy	The institute has an articulated policy relating to ePortfolio purpose, use, and development.
Connectivity to support ePortfolio development	Systems are networked together to allow the sharing of ePortfolio resources.
Interoperability/transferability of data	The system offers flexibility with regards to the import and export of data.
Curriculum ICT Policy	A clear vision has been defined on the use of ICT in the institute
Institutional embedding	Acceptance of the ePortfolio in the institute.
Staff ICT Skills	The majority of staff is ICT affluent.
Staff engagement to ePortfolios	Engagement is universally positive.
Staff as providers of online feedback	Staff work regularly, constructively, and formatively on giving feedback on ePortfolio material.
Autonomy in the construction of ePortfolios	Students autonomy is encouraged as a matter of policy.
Student capability of autonomy in learning	All students are capable of making autonomous choices regarding their learning goals and style.
Student's electronic links to the organization	Students can access the ePortfolio from home.
Access to ePortfolio	The ePortfolio is available anywhere, anytime.
ePortfolio ownership	Students can decide which aspects of the ePortfolio are shared.
Learners as active creators of digital content	Students are active and regular creators of content.
Learners as seekers and users of feedback	Students seek feedback regularly.
Learner engagement to ePortfolios	Engagement is almost universally positive.
Usability	The interface is well designed and intuitive.
Reusability	Any agreed type of data/file can be stored.

Note. (Hartnell-Young et al., 2007)

Appendix B
Executive Information System Success Factors

Critical success factor	Description
Committed and informed executive sponsor	Executive sponsor who is committed to the implementation, invests time and effort and has a realistic understanding of the system.
Operating sponsor	Operating sponsor who actively manages the implementation and its details, to leverage the time of the executive sponsor.
Appropriate supporting staff	Supporting staff who have technical as well as business knowledge to support the implementation of the system.
Appropriate technology	Selecting the most suitable system on the market, which is crucial since the choice has a major bearing on the acceptance of the system.
Management of data	Ability to provide access to reliable data from internal and external sources. This may involve the aggregating, accessing and extracting data from various databases.
Clear link to business objectives	The benefits of the system and link to a certain business problem / objective are clearly defined. The system should provide something that adds value.
Management of organizational resistance	Proactively managing organizational resistance in the introduction and operational phase, which is a common cause of implementation failure.
Management of system evolution and spread	Identifying specific job functions, technical orientation, work style and support needs of each user.
Evolutionary development methodology	Prototyping to discover how the system can add value.
Carefully defined information and system requirements	Identifying information requirements that meet the organization's needs in terms of the defined objectives.

Note. (Poon & Wagner, 2001)

Appendix C
Goals and HCM Objectives for the Five Cases

C1	Result
HCM goals	× Shift to recruiting personnel based on competences (clusters of knowledge/skills/attitudes which enable a worker to work effectively).
	× Structuring training and on-the-job learning with the ePortfolio by using elaborate competences.
	× Recording and monitoring process of in-house education with the ePortfolio.
Objectives	± Describing 16 job functions in terms of primary tasks in alignment with educational records
	× Completed ePortfolio profiles of all employees currently involved in (internal or external) education.
	× Identifying competences relevant for the different job functions and embedding them in the ePortfolio.
	× Gaining insight in the talents of employees.
	× Shortening duration of training due to enhanced insight in competence mastery levels.
	× Expanding the number of participants to 200 in 2 years' time.

Note. ✓ = Successful, ± = Acceptable, × = Unsuccessful.

C2	Result
HCM goals	× Improve the composition of teams based on competence assessments in the ePortfolio
	× Fostering internal mobility (redeploying personnel in positions appropriate to their competences) through identifying talented employees based on ePortfolios
Objectives	× Develop a valid competence test to be used in the ePortfolio
	× Completed ePortfolio profiles of all participants
	× Gain insight in the competences of participants on an aggregate level
	× Expand the number of participants

Note. ✓ = Successful, ± = Acceptable, × = Unsuccessful.

C3	Result
HCM goals	± Gain insight in professional development of employees.
	± Fostering (internal and external) mobility of employees.
Objectives	✓ A description of all job functions, roles, tasks and associated competences.
	✓ Completed ePortfolio profiles of all participants.
	± Including ePortfolio training in the company training.
	✓ Embedding the ePortfolio in the existing HR software.
	± Active use of ePortfolios among employees.
	± Gain insight in the talents of employees.
	± Expand the number of participants to 120.
	± Exchanging data on requested competences with the vocational institute where employees are recruited from.

Note. ✓ = Successful, ± = Acceptable, × = Unsuccessful.

C4	Result
HCM goals	± Fostering (internal and external) mobility of employees.
	± Improve the composition of teams based on competence assessments in the ePortfolio.
	± Stimulating professional development of employees.
Objectives	✓ Completed ePortfolio profiles of all participants.
	✓ Active use of the ePortfolio system by both the participants and supervisors
	± Insight in the competences of participants on an aggregate level.
	± Developing a competence test which is linked to relevant job functions in the pilot.
	± Exchanging data on requested competences with a local university to recruit graduates more effectively.
✓ Embedding existing competence profiles of the organization in the ePortfolio.	

Note. ✓=Successful, ±=Acceptable, ×=Unsuccessful

C5	Result
HCM goals	× Enhancing the professional development of employees,
	× Stimulating mobility of employees.
Objectives	× Describing relevant competences for the job functions in alignment with vocational training institutes.
	× Recording both the vocational generic competence levels of employees in the ePortfolio.

Note. ✓ = Successful, ± = Acceptable, × = Unsuccessful.