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Challenges and Rewards of Implementing ePortfolios Through a Bottom-Up Approach

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While there have been multiple studies describing various ways in which administrators at higher education institutions can and should motivate faculty to increase their use of technology as an instructional tool (e.g., Surry & Land, 2000; Gautreau, 2011), very few have focused on cases in which faculty provided the initial and sustained impetus. This article attempts to fill that research gap by reporting on the results of a case study at a public university, where ePortfolios were implemented over a 15-year period using a bottom-up approach. The case study concluded that this approach has both limitations and benefits. The most notable limitation is that typically, faculty are not initially provided with the resources to implement ePortfolios, which results in a slow rate of adoption. Numerous recommendations were also identified that are especially relevant for institutions that utilize a shared governance model.

A common goal of many public regional higher education institutions is to facilitate the development of lifelong learners who are engaged in their communities. Despite, or perhaps because of this lofty aim, there are many factors that hinder the attainment of this goal. One reality is that institutions typically do not provide the opportunity for students to showcase and integrate their significant learning experiences through a single medium. This is due, in part, to faculty, especially in higher education institutions with a strong history of shared governance, wanting autonomy over their courses and student assignments. The use of a uniform medium (i.e., electronic portfolios) for documenting student learning is viewed by some faculty as a constraint on their academic freedom, even though they support in theory the goal of helping students integrate their experiences across the curriculum. As expressed by a faculty member, "Anything that tries to build consensus seems to be a difficult conversation to engage in." Add to this the perception that integration of an electronic portfolio can be costly and it seems unlikely that electronic portfolios will be successfully implemented or sustainable given the limited funds available to many of the smaller public higher education institutions. This case study demonstrates how it is feasible by documenting a 15-year, faculty-led initiative focused on developing and implementing electronic portfolios as a tool for students to represent and integrate their knowledge and skills.

Although there are case studies that describe how electronic portfolios have been implemented using a top-down model (e.g., Hains-Wesson, Wakeling, & Aldred, 2014) and middle-level model (e.g., Slade, Murfin, & Readman, 2013), the literature describing how years-old projects have been initiated and sustained by faculty is more limited. More recently, several bottom-up model electronic portfolio projects have been briefly described in the Connect to Learn Scaling Up Stories (http://c2l.mcnrc.org/category/campus-stories/scaling-up-stories/). In particular, projects at Hunter College, Northeastern University, San Francisco State University, Tunxis Community College, and Virginia Tech appear to embody this implementation approach.

Along with the different methods of implementation, there are a variety of software programs that can be used to create ePortfolios. These vary from open source programs such as Sakai to commercially available electronic programs such as Digication and TaskStream. Another option is to use free programs like Google Sites or Foliospaces. Cost, ease of use, and ownership of data are all determinants when an institution is deciding which program should be used to create the electronic portfolios. Many times, when a choice of software must be made, cost is the overriding factor.

This case study adds to the literature base because it encompasses longevity, faculty initiation, and perpetuation, as well as cost avoidance through the use of free or open source software.

Institutional Context

The case study took place at the University of Michigan-Dearborn (UMD), a regional campus of the University of Michigan located in southeastern Michigan, adjacent to the city of Detroit, with an enrollment of approximately 9,000 students. With respect to graduate education, UMD is primarily a master's degree-granting university, but it does have two doctoral programs, in engineering and education. There are four important contextual features of UMD, which are also common to many other colleges: a diverse and large population of nontraditional students, a pledge to address the needs of the local region, faculty participation within a model of shared governance, and a commitment to the teacher-scholar paradigm.

Although the majority of students commute to campus, the diversity of the student population rivals

that of larger, residential schools. Twenty-five percent of the students self-identify as students of color and were born in 52 different countries. Approximately 60% of the students are the first in their family to attend college, and 80% remain in the area after they graduate. Over half of the students are older than 25, and the typical student works about 20 hours a week in addition to completing courses at UMD. This diversity is reflected in the rich array of experiences, skills, and knowledge the students bring to the university classrooms and to the content and structure of their electronic portfolios.

In part because alumni tend to stay in the region, the university has a strong commitment to the local area. This is evidenced by UMD's participation in the Coalition of Urban and Metropolitan Universities, one of whose goals is to provide an educated citizenry and workforce for the states and regions represented by its members (Coalition of Urban and Metropolitan Universities, 2014). As a member, UMD is an active community partner involved in improving the social and economic lives of residents in the region by offering academic service learning courses and community engagement projects through institutional resources such as the Office of Civic Engagement and the Office of Metropolitan Impact. Recently, UMD was awarded the Community Engagement Classification from the Carnegie Foundation for the Advancement of Teaching. That designation represents acknowledgment of the university's commitment to being deeply engaged with the region.

Since the university employs a model of shared governance, the 585 faculty employed by UMD are accustomed to a large degree of academic freedom. As is common among many institutions that have shared governance, many faculty perceive any course requirements mandated by the administration to be an infringement on their academic freedom. This includes learning management systems, policy statements on course syllabi, and specific formats for assignments, such as the ePortfolio. Faculty perception of what constitutes shared governance is an important cultural feature of the university that enabled the electronic portfolio to be successfully implemented from a faculty-led rather than an administration-led initiative.

To show its commitment to teaching excellence, UMD embraces a teacher-scholar model. This approach is described by the Association of American Colleges and Universities (AAC&U) as one in which faculty are

> committed to high-quality undergraduate education, pursue an active program of research and scholarship, and are presumed to enliven and enrich their teaching and student experience by incorporating insights from their own research into their instructional activities, student advising, and related work. (Kuh, Chen, & Laird, 2007)

The ultimate goal of the teacher-scholar model is for students to acquire deep knowledge that they can use as they become lifelong learners who are able to consider new questions and make informed decisions (AAC&U, 2007).

Theoretical Framework

The theory of technological determinism posits that technology itself will drive implementation and that the power and promise of new innovations will motivate individuals to adopt nascent technologies (Oliver, 2011). This, of course, does not take into consideration the human element and the impact individuals can have on bringing about change within any given organization. As a result of that human element, new innovations are rarely adopted unanimously but instead follow a pattern of diffusion, as first described by Ryan and Gross (1943). In their seminal study of the use of corn seed among Iowa farmers, the researchers discovered that the rate of adoption of new varieties of seeds was longer than expected and influenced by a variety of social factors. Rogers (2004) defined diffusion as "the process through which an innovation, defined as an idea perceived as new, spreads via certain communication channels over time among the members of a social system" (p. 13). Based on this definition, the theory of diffusion can be applied just as easily to technological innovations as to the adoption of corn seed. The pattern of adoption in this theoretical framework generally follows a standard bell-shaped curve populated with the following categories: innovator, early adopter, early majority, late majority, and laggards (Zayim, Yildirim, & Saka, 2006).

Diffusion relies on a small group of innovators who are willing to try out a new innovation. These individuals are often seen as a pilot group, willing to implement new technologies and processes even if they are not fully formed or tested. The investigation of the implementation of the ePortfolio is framed within Rogers (1995) and Zayim et al.'s (2006) theoretical frameworks of the pattern of diffusion. That is, particular attention was paid to whether faculty fell within the different categories of technological innovation.

Methods

A case study method was used to investigate the implementation of the ePortfolio via a bottom-up approach. This research approach involves investigating events in context and often results in specific recommendations for action (Mills, Durepos, & Wiebe, 2008), while a particular case within the study is specific to time and place (Johansson, 2003). The case within this study is the use of the ePortfolio on the

UMD campus for a 15-year period, 1999-2015. The particular case study approach employed in this study follows Stake's definition (as cited in Johansson, 2003) that the object of the study (e.g., the case) is more important than the methods of investigation. As a result, multiple methods of data collection (e.g., both quantitative and qualitative) were used with the "purpose of illuminating a case from different angles and different methodologies" (Johansson, 2003, p. 3). In this case study, quantitative data were collected to determine which faculty used the ePortfolio in their courses and when they first used the ePortfolio. The qualitative data included informal collection of comments during conversations or meetings and also through semi-structured interviews with a convenience sample of 13 faculty who had used the ePortfolio in at least one of their classes. The interviews were conducted by the authors in 2013-2014 and lasted anywhere from 30 minutes to 1.5 hours in length. The questions focused on the faculty member's history of using the ePortfolio, on motivations for use, and on whether the use of the ePortfolios had impacted faculty members' perception of their students. Students were not interviewed formally for this research. Any quotes attributed to students in this narrative were derived from informal conversations and comments made during class sessions and office hours. The research questions guiding the in-depth analysis within this case study are: How was the ePortfolio implemented in a higher education institution with a strong shared governance structure, and how would knowing this reveal factors that would facilitate the implementation of the ePortfolio on similar campuses?

Innovators and Early Adopters: The Science Education Portfolio

Within the context of the larger university, the teacher preparation program at UMD embraces a social constructivist theory of learning, which states that learners construct new knowledge based upon prior knowledge and experiences (Vygotsky, 1978). According to this theory, teachers and students both generate knowledge as they reflect and work together towards conceptual understanding of the content (Vygotsky, 1978). Even though the school employed this model of knowledge acquisition, there was not a place for students to reflect upon their knowledge. In 1999, this deficiency was noticed by a small group of education and natural sciences faculty involved with the elementary science education program. This group also recognized a need for acknowledgement of nonformal learning experiences, since valuable skills and knowledge are also gained during those experiences and provide the foundation for further learning. To address both of these needs, a grant was obtained in 2000 through the Fund for Improvement of Postsecondary Education to partially subsidize development of Science Education Portfolios (SEP). SEP was the first formalized use of ePortfolios to be implemented at the university. At the inception of SEP, it was limited to a sequence of six science courses and was required of students seeking initial elementary teacher certification. Students used Microsoft Frontpage and file transfer protocol to edit and load their SEPs to a UMD server for review. The process of creating the portfolios and loading them to university servers was difficult for many students and for the faculty who needed to acquire the technological skills themselves in order to teach the students. As one faculty member commented,

> We spent a lot of time teaching them how to edit html, which wasn't fun. I think we spent more time teaching them how to write and code html than we spent trying to get them thinking about the work or the papers.

The SEP portfolio, because of its heavy technical training focus, largely fell into the "enrichment add-in" category as defined by Massy and Wilger (1998). The other two levels of technology adoption include personal productivity aids and paradigm shifts. *Personal productivity aids* are defined as any tools or technologies that allow one to work more efficiently. *Enrichment add-ins* are resources such as multimedia, websites, and simulations that can be used to enhance the educational experience but do not fundamentally change how instruction is delivered. The paradigm shift level of innovation involves an actual change in how teaching and learning take place as the result of implementing a new innovation or technology. SEPs were unexpectedly an effective way to develop the technology skills and proficiencies of students and faculty (similar to Milman, 2005), while also laying a solid foundation for future ePortfolio integration to impact teaching and learning within School of Education (SOE).

Within a year of SEP adoption, several other academic programs recognized the SEP model as a useful tool for students to reflect upon their learning experiences and to integrate the connections between their classroom experiences. In 2002, the Early Childhood Education (ECE) and Educational Technology (Ed Tech) faculty started to use ePortfolios with their respective classes by modifying components of the SEP to meet their programs' goals. The time required to implement ePortfolios within ECE and Ed Tech programs was greatly reduced in comparison to the initial development of the SEP because a model now existed. While the three programs had much in common, they operated and supported ePortfolios

independently from each other, including using different platforms. This resulted in redundant work for students, who were required to create and maintain multiple portfolios in order to satisfy the requirements of the ECE, Ed Tech, and Science Education programs, including mastering different tools. Additionally, in all three programs, lecturers often taught courses for a term or two, requiring continual professional development (both technical and pedagogical) as new lecturers were assigned core ePortfolio courses. Because of a lack of institutional structure, faculty shouldered professional development responsibilities with only minimal assistance from technology support staff, who had other job responsibilities. While the administration supported the use of ePortfolios in general, there were not any financial resources set aside for portfolio integration, so that the use of portfolios was largely dependent on individual faculty implementing them in their respective courses.

Early Majority Adopters: From Program Level to School Level Discussions

In 2003, SOE governing faculty and administrators acknowledged that a more formalized approach to using ePortfolios would benefit students and faculty and could be used by SOE to demonstrate a student's attainment of specific state standards for accreditation purposes (see Reese & Levy, 2009). An ePortfolio committee was formed and charged by the dean with the task of aligning relevant state standards for beginning teachers with courses offered at the SOE. By aligning standards and courses, assignments could be identified from specific courses to serve as artifacts for students to include in their portfolios. In this alignment process, the committee identified several issues that would need to be addressed before proceeding with the integration of portfolios at the school level. Many of the issues concerned questions of policy, such as how state standards aligned with institutional and unit level goals; the meaning of basic proficiency; whether requiring faculty to incorporate specific assignments impinged on academic freedom; and whether portfolios would be used as a means of program assessment and course alignment. Other questions concerned the functional requirements for tool adoption, including who would own student portfolios; how access between students and faculty/administrators should be managed; how portfolios could demonstrate individual development over time; by what process faculty should assess student portfolios; and how portfolio submissions and requirements should be managed. While the committee developed school-wide recommendations (including utilizing one software program across all programs), the three SOE programs continued to have their students work on their program-specific portfolios.

The committee's recommendations focused largely on ensuring that faculty and students had flexibility with respect to which artifacts would be included in the ePortfolio, how they would be integrated into the teacher certification program, and who would be responsible for reviewing the portfolios. These recommendations were that:

- students be allowed to select from among several assignments in a range of courses to demonstrate that they have met the appropriate proficiency level;
- the majority of the portfolio construction and evaluation should take place as part of the student teaching seminar at the end of their program; and
- students should have several professional competency checks along the way to ensure that they are developing appropriately throughout their program.

Unexpectedly, the process of implementing ePortfolios helped align institutional requirements to state professional standards and engage faculty in discussions and decision-making that had implications well beyond ePortfolios (e.g., ownership of student/course work, program vs. school-wide decision making, assessment standards, etc.), in addition to the original goal of serving as a powerful educational tool for students and faculty (see also Inoue, 2009; Lorenzo & Ittelson, 2005).

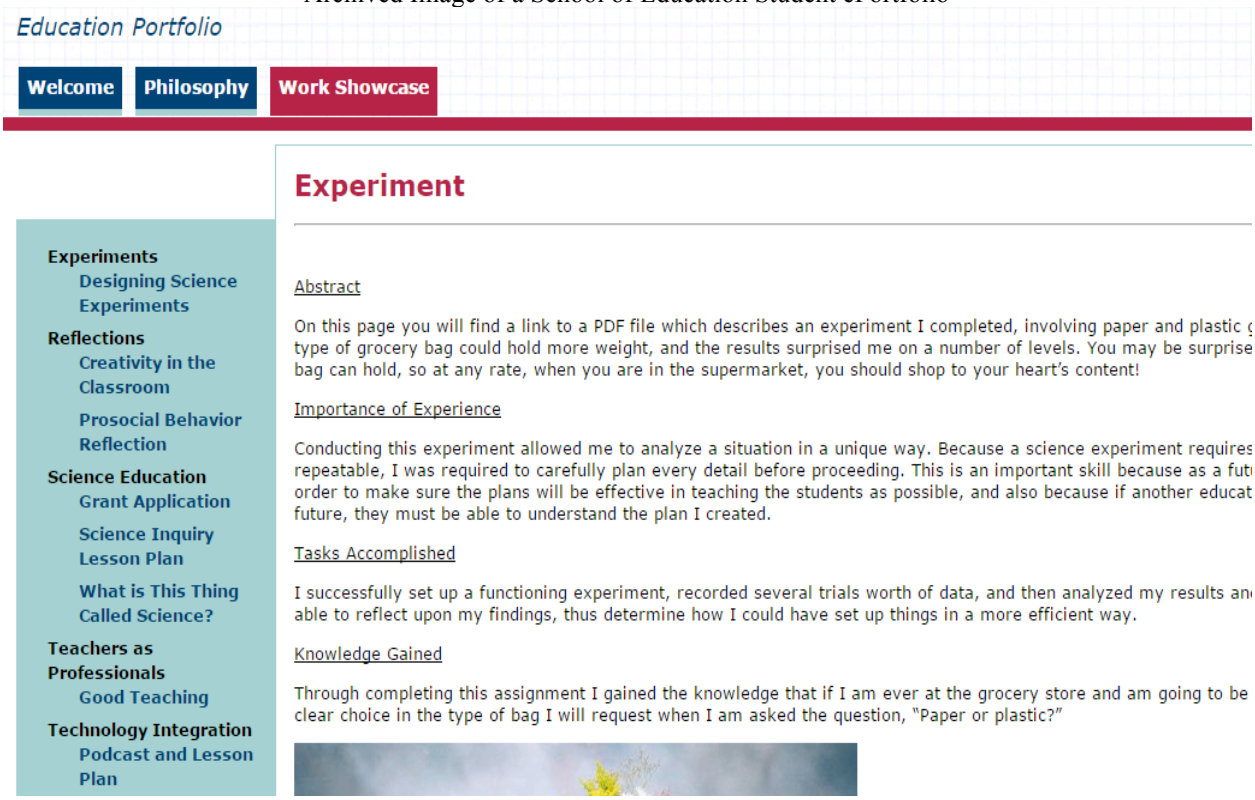
Toward the end of the 2006-07 academic year, it was discovered that one of the UMD sister campuses was using the Open Source Portfolio (OSP) to integrate ePortfolios. School of Education faculty approached the administration and inquired about exploring the use of OSP in the SOE. Permission was given to pursue this option, and in the winter of 2008, a presentation was given at an SOE Governing Faculty meeting that outlined the features and functionality of the OSP tool. This tool was built on the Sakai platform and was directly connected to the learning management system (LMS) that students and faculty were already using, which meant that the interface was quite familiar to the majority of potential users. Since the Dearborn campus was already receiving support for using the Sakai LMS, there was no additional cost for supporting the use of the OSP. After this presentation, it was decided whether the SOE would enter into a pilot phase for the 2008-2009 academic year. The SOE administration supported this decision because it allowed the school to leverage the resources already designated for use of the Sakai LMS. The UMD sister campus was also in favor of the school piloting OSP, as it allowed them to expand their research and development of the tool. During this phase, faculty developed and implemented a shared vision and an initial plan for piloting and evaluating OSP

across the curriculum. This included identifying existing curricular pathways and pedagogical strategies to support students in fully utilizing ePortfolios and developing new strategies where necessary. This phase also included a small pilot of students using ePortfolios in specific areas of the curriculum.

Engagement of faculty was voluntary and varied during the piloting phase. Again, while the administration was supportive of participation in the pilot, it was left to individual faculty members to decide if they wanted to participate, which meant learning how to use the portfolio tool and revising their courses to integrate it effectively. More than half of the faculty fully embedded ePortfolios into their courses, expecting full-scale implementation to follow the pilot. In contrast, two faculty members were hesitant to fully embrace ePortfolios in their classrooms because of a lack of clarity concerning how ePortfolios would be adopted beyond the pilot. As one stated during one interview, "I don't know how this is going to play out with the School of Education so I don't want the portfolio to be that integral in the class." Three were concerned that ePortfolio implementation might become overly structured and lose its value for their classroom and for students, in particular transfer students.

During the summer of 2009, as a result of the one-year school-wide pilot, SOE faculty determined that ePortfolios should be focused on engaging students in analysis, reflection, feedback, and dialogue in order to help them understand how their varied experiences (both in the classroom and outside of the classroom) could demonstrate their core values and philosophy towards teaching. The focus at this point was consistent with contemporary ePortfolio research, including the work of Young (2002) and Richardson and Ward (2005). To meet this focus, students were required to include Welcome and Philosophy pages where students could introduce themselves and share their thoughts and ideas about teaching and learning. In addition, each student developed a Work Showcase, which was a collection of "examples of work" in which students documented and reflected on their learning as they moved through the teacher certification program. Students organized their Examples of Work within the Work Showcase into skill areas that represented their teaching values and core strengths. Figure 1 shows an archived image of a student portfolio from this period of ePortfolio implementation.

Figure 1
Archived Image of a School of Education Student ePortfolio



From 2009-2011, SOE faculty worked to integrate ePortfolios into their coursework using OSP. The use of ePortfolios was not required, but all faculty choosing to use portfolios with a class were expected to use OSP to minimize confusion for students. Faculty across the school agreed that students would maintain one ePortfolio for all of their courses, allowing students flexibility within the basic structure (as described above) in completing portfolio assignments across their courses. Regular training sessions were developed and facilitated for students and faculty in order to help them learn the basics of the OSP software. In addition, a new course called Introduction to Education was created and required of all students entering the teacher certification program. This course was first offered in the Fall 2010 term and was focused on helping students understand the core expectations for teachers graduating from UMD, becoming familiar with portfolio requirements so that they could document their development towards the core expectations, and crafting a basic start to their portfolio, including a welcome page and philosophy statement. The expectation was that these basic components would evolve as students worked through the program. Having students take this class early on in their coursework helped them understand the value and purpose of developing a portfolio over time, as well as develop the technical skills to continue working on it in subsequent classes. With this basic foundation set through the Introduction to Education course, faculty teaching subsequent classes could shift their focus from the basics of portfolios to portfolios that were intentionally tied to the goals of their course, thus allowing portfolio work to move from being an enrichment add-in to a paradigm-shift level of innovation (Massy & Wilger, 1998).

As portfolio use became more prevalent in the SOE, other departments and academic units on campus became interested in using them as well. Faculty from a variety of disciplines, including engineering, English, foreign languages, writing, math, and the sciences started to incorporate ePortfolios into their own courses. In response to the expansion of ePortfolio integration across campus, in 2010 a new university-level administrative position was created to manage the use of portfolios throughout the institution. The creation of this position made it possible to leverage the work and resources of individuals across the campus and for the project to move forward as a collaborative ePortfolio initiative rather than several disparate groups working in isolation from each other. While we maintain that the stimulus and initial support for ePortfolios on campus came from faculty, the hiring of a faculty member to oversee ePortfolio development and implementation was also crucial once the portfolio had gained some momentum and credibility at the university. It also signified explicit support from the Provost and central administration for the use, and importance, of ePortfolios across all disciplines. Figure 2 shows a rapid increase in the number of faculty who used ePortfolios once the position was staffed. It is important to note that the decrease from 2013-2014 occurred when the faculty member was on a leave of absence and the position was left largely unstaffed. This individual returned to campus in 2015 to resume the role of ePortfolio support, recruitment, and assessment.

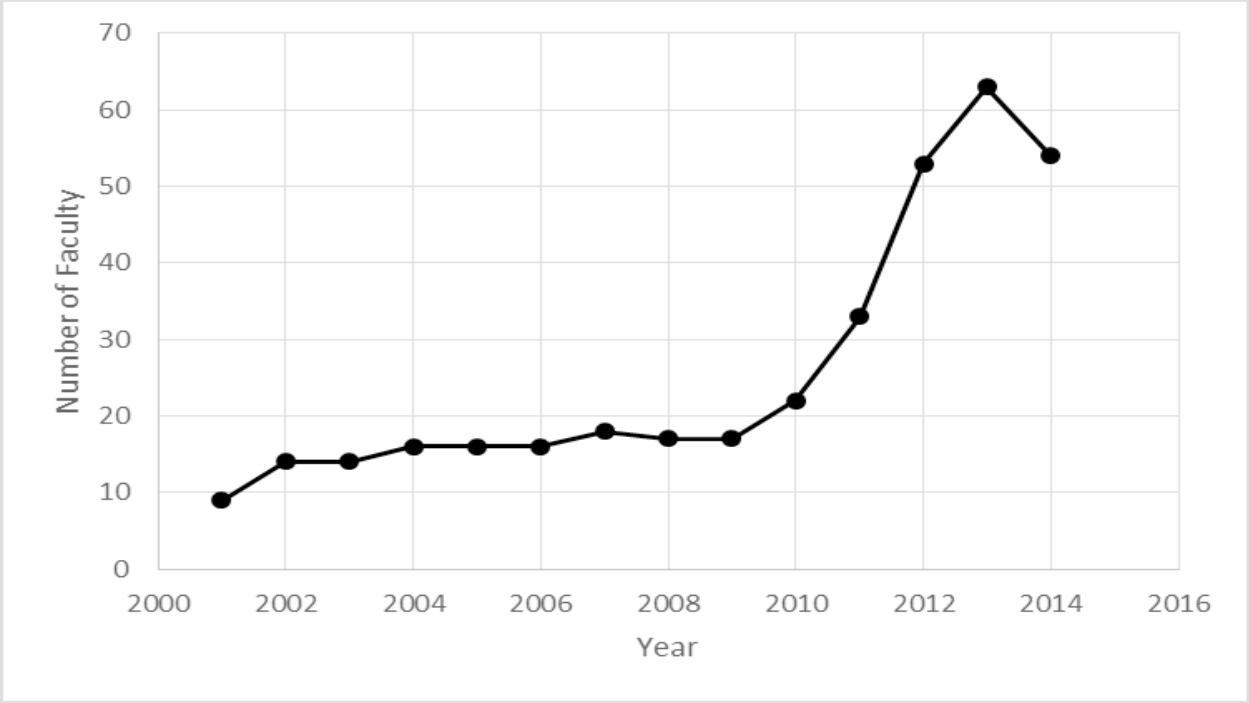
In 2011, it became apparent that the OSP tool was no longer going to be supported by the university, which necessitated the transition to another portfolio option. Google Sites was selected as the new option for a variety of reasons. First, UMD was already planning to transition to the Google suite of productivity tools so using Google Sites fit logically with that initiative. Secondly, Google Sites provided the SOE with an interface that was easy to learn and manipulate and that was familiar to a majority of faculty and students. Finally, Google Sites is independent of the university, unlike the OSP tool, which was directly tied to a student's enrollment status. By using Google Sites, students could continue to have access to their ePortfolios even after they graduated. The transition to Google Sites took place from 2011-2012 and at present, all faculty and students utilizing ePortfolios use Google Sites.

Shifting Paradigms

A major source of data was 13 interviews with faculty members who had implemented the ePortfolio. While the interviewees were selected using a convenience sample, an attempt was made to interview faculty who had implemented portfolios in different phases of adoption and came from different units on campus. The sample of faculty included three innovators, two early adopters, three late majority adopters, and five late adopters. Six faculty members were from the SOE, two from the natural sciences, one each from engineering, sociology, psychology, composition, and student affairs. An inductive analysis (Thomas, 2006) of the interview transcripts uncovered several shifts in how faculty members perceived their classrooms. Most notably, all interviewees found that implementing portfolios in their classrooms positively impacted their perceptions of students. As stated by a faculty member (who was a late majority stage adopter) of over 40 years,

> All of the sudden, I am seeing students as live people with hobbies and interests and goals and I developed a respect for them, a new kind of respect. I always respect students, but it is a new kind of respect because I am aware of their aspirations. That alone is worth it.

Figure 2
Number of Faculty Using ePortfolios by Year



Or, from the perspective of a late majority stage adopter lecturer,

> It gives me some insight into them personally so I can continue to make the connections. They may allude to a brother or sister who has autism or something like that. I connect with them and I also get a better feeling for students who are struggling to write.

Another faculty member of 20 years who was also a late adopter remarked,

> You really can see their backgrounds and experiences and it just really made each of them seem somehow unique. And I think after a while you get to where you forget that and you can't as a teacher—you go up there and you do your thing and you get so burned out and you forget. To me at this point in my career, I really felt like that is a valuable thing for me.

As faculty gained insight into the aspirations of their students, over half of the interviewees commented on how their instructional practices changed to make assignments more applicable to students' goals. This was true regardless of what stage of innovation the faculty member was in. The most common adaptation was integrating examples into lectures or handouts that were directly related to students' career goals. As an example, one engineering faculty member learned that his student was interested in helping remote villages have access to clean water. As a result, the faculty member modified a lecture to specifically include discussion of hydraulic engineering. One faculty member who was an early adopter was able to better align her teaching based on how her students perceived the value of assignments:

> It's given me a much better thermometer to their experiences in my classroom, which is what I didn't fully expect . . . [W]hat I aim as the usefulness of something is not what they see as useful. I'm not saying that their [perspective] is wrong and mine is right, but it is a disconnect that I didn't see before.

The majority of faculty commented how metacognition and reflection became the focus of portfolio assessment. As expressed by an innovator stage Education faculty member,

> What I'm hoping to see is kind of the ability to kind of connect the assignments to a broader theme

> for the class so kind of what's coming out of it . . . to develop some metacognition. Moving from individual assignments to looking at all the assignments . . . that's a shift.

Or, as a late adopter recalled telling her students, "You're being graded on what you learned, how you framed it, and how you can come up with some sense of what you got out of that experience." This shift in expectations created the greatest challenge for nine of the interviewees, as they felt students struggled to reflect and make connections among their experiences. As summarized by an innovator stage Education faculty member,

> I think reflecting is hard work. Worthwhile reflection, connection making is hard. They don't always come easy, a lot of times they almost come serendipitously, some investments of thought are important and it doesn't always feel good. It's fuzzy work. It's not passive task-oriented work. And yet we are trying to attach a task to it.

While the process of designing and implementing ePortfolios at the university progressed, a variety of issues arose that at times seemed to have conflicting goals. For instance, when the ePortfolio was used solely by the science education faculty and their students, it was possible to have one commonly agreed-upon goal for the portfolio, but as different content areas within SOE and later units within the university adopted the portfolio, the content and purpose of the ePortfolio needed to be expanded to meet the needs of a wider and more diverse group of faculty and students. Meetings between existing users of ePortfolios and other interested faculty/departments resulted in a single agreed-upon purpose for ePortfolios on campus: it was to be used as a tool for students to integrate program learning goals with experiences within and outside of UMD classrooms. The overarching goal, which is still in place today, is for students to gain a deeper understanding of their own learning and to be able to articulate the knowledge and skills they possess. This goal is broad enough to satisfy colleges within the university that must provide evidence of student learning to accrediting agencies, as well as to programs within the social sciences or even student leadership organizations.

Based upon the main campus goals, SOE faculty created a common rubric to help standardize and systematize review of student teaching ePortfolios. A rubric used with Science Education Portfolios in the early 2000s served as a starting point for the development of a college-wide rubric for SOE and as a model for other units needing a rubric model. Developing a common rubric occurred over the course of an academic year. First, governing faculty were engaged in work sessions to identify learning outcomes that would be appropriate across a variety of content areas. Once common learning outcomes were identified, the criteria and scales for the rubric were established. The resulting rubric is used as a final assessment for student teachers and also has the core elements used in various SOE courses. This format provides faculty with the freedom to adjust the rubric as needed, while making sure that the final learning outcomes, as students progress through the teacher education program, are visible to all students and faculty. The SOE rubric illustrates how assessment of the ePortfolio contents can be efficient and outlined clearly for faculty, while still allowing for individual student expression. The SOE rubric has also helped align student expectations of their program and learning expectations, since the learning outcomes are presented transparently to them at the beginning of their program. Faculty in the other units have used the SOE rubric as a basis for developing their own rubrics, to reduce perceptions about the difficulty and time required to evaluate student ePortfolios.

This case study focused solely on data collected from faculty members using ePortfolios in their courses. Future research will investigate the impact of ePortfolios on students and their ability to better integrate their learning as a result of reflecting on their thinking within the portfolio. This line of research is a logical follow-up to the current study, as it will help to guide instructors more effectively in their use of ePortfolios and provide potential evidence to support the broader implementation of portfolios across all academic units.

Discussion

The first case study research question— "how was the ePortfolio implemented in a higher education institution with a strong shared governance structure?"— revealed that the Science Education Portfolio group served as the innovators who tested ePortfolios in their curriculum. As interest grew, the early adopters came on board, and interest in the new innovation grew (i.e., Educational Technology and Early Childhood Education). Adoption led to the early and late majority (i.e., other departments and programs) coming onboard with implementing ePortfolios. Resources and energy were devoted to supporting willing adopters rather than trying to convince laggards to integrate ePortfolios in their teaching.

The second research question asked how understanding the implementation of the ePortfolio in this case would enable the identification of features that would facilitate the implementation of the ePortfolio on similar campuses. This led to five recommendations for

similar institutions wanting to implement a reflective, integrative ePortfolio. They are:

First, recruit a small core of faculty who are dedicated to the project (i.e., identify and recruit the innovators and early adopters). Keep in mind that it only takes an adoption rate of 10-20% to constitute a critical mass and increase the likelihood that an innovation will be sustained (Rogers, 1995).

Second, identify core values of the ePortfolio as early as possible in the project. While the details may change depending on the unit or faculty, the core values and goals of the portfolio should remain the same. In addition to providing a common language and set of goals for students and faculty, it will also provide a framework that can be used to evaluate the impact of the ePortfolio, despite differing contexts.

Third, keep the ePortfolio work visible through faculty/staff brown bag lunches, student showcases, etc. Such events, where the adopters—whether students or faculty—describe in their own words how the ePortfolio has affected their learning/teaching generate enthusiasm for the ePortfolio. These opportunities also allow faculty to share models of implementation and develop best practices as a community.

Fourth, have a variety of resources available to teach students, staff, and faculty the technological skills needed to create an ePortfolio. We have found that faculty do not have or want to use classroom time to teach students how to set up their ePortfolios. Similarly, many students like to "mess around" on the computer and figure out the technology themselves or by watching a video or reading a handout. One technique we found helpful was to hire student workers to staff open ePortfolio studio hours for those faculty and students who learned best through individualized direct instruction or who had particular questions they wanted addressed.

Fifth, BE FLEXIBLE! Recognize that your ePortfolio is a tool and should not be dependent upon a single learning management system or software program. It is difficult to anticipate the technologies that will be available for future ePortfolios. During the past 15 years, we have used multiple programs and sites to host the ePortfolios. Once we became invested in the goals of the portfolio and less wedded to a particular host or program, the inevitable changes that occurred were less difficult to navigate. It does take time and effort on everyone's part to transition to new software, but if the ePortfolio goals are similar, students see that their prior ePortfolio work can be integrated into the new system, and faculty are able to adapt their instruction rather than having to start over.

It is worth noting that none of these recommendations mentions soliciting support and resources from administration. Case study analysis indicated that in an institution with shared governance, the crucial driver for implementation and sustainability of ePortfolios is faculty buy-in. Once that is established, specific resource needs become apparent and can be communicated to the administration, along with ePortfolio artifacts that demonstrate the value of the portfolio. Basing the ePortfolio on faculty commitment also makes it less likely that the innovation will be seen as an administrator's "pet project," destined to die when personnel change or priorities and political winds shift. This is not to suggest that administrative support is not necessary or important when implementing ePortfolios across an academic unit. Within all stages, the SOE faculty openly communicated with administrators and shared ideas on the use of ePortfolios within their classes and across the broader curriculum. In addition, the administration demonstrated support for ePortfolio integration through the development of an ePortfolio committee and allowance of ePortfolio related agenda items at governing faculty meetings. However, this initiative moved forward because a core group of faculty was interested in integrating portfolios in their courses and saw the benefit of expanding this integration more broadly across the entire School of Education.

The development and implementation of the ePortfolio over the past 15 years has not been a linear or even a continual process. There have been many periods of stagnation (e.g., during the middle phases of the science ePortfolio) as well as times of rapid change (e.g., when a new ePortfolio system such as Google Sites was adopted by UMD). But what has always been present is a commitment to the goals of the ePortfolio and faculty motivation to integrate the portfolio into their courses. The number of faculty involved in the project has grown steadily through word of mouth, from involved faculty to their colleagues seeking a venue to encourage their students to integrate learning experiences and develop reflective skills. The students' response to the ePortfolio has also been positive; in fact, students have asked faculty excitedly at the beginning of a term, "Will we use the ePortfolio in this class?" We have also discovered that students are motivated enough by the ePortfolio that they begin those assignments earlier than other assignments, since they want the portfolio to represent their best work to a wide audience. The examples of work on the portfolio are no longer viewed simply as assignments to complete for a class; rather, they are meaningful representations of what the students know and can do.

Although the administration provided staff support in the latest stages of implementation, the vast majority of the work was done, and is still done, voluntarily by the faculty. In fact, specific senior officers were quietly told to temper their enthusiasm for the ePortfolio so that the initiative would not be

associated with administration and thus become influenced by the politics present between the administration and faculty. Happily, the senior officers complied with the request, and the ePortfolio is viewed as a faculty-led initiative.

The bottom-up model of innovation implementation has proven to be successful and sustainable at an institution with shared governance since the model does not depend on administrative support, the commitment of a specific faculty member, or even a particular technology.

Surrey and Land (2000) identified categories of innovativeness in order to create a framework for supporting faculty in the implementation of new technologies. One of the key components they identified was an institutional commitment to change backed by ongoing training, financial support, access to relevant technologies, and a willingness to accept failure as new strategies and technologies are being implemented (i.e., creating a staff position to support ePortfolios). The widespread adoption of ePortfolios and other instructional technologies would be difficult to sustain in the absence of these supports, even in institutions employing the bottom-up model of innovation diffusion, as there are limits to the impact that innovators and early adopters can have on the momentum of a new innovation. The UMD case study supports the notion that adequate institutional support (training, pedagogical support, financial support, and access to technology) is necessary to deal with the inevitable issues and roadblocks that arise with any new initiative.

Conclusion

This case study has demonstrated that the bottom-up approach is an effective change management process to use in shared governance settings when implementing technological innovations such as the ePortfolio. Over the past 15 years, the ePortfolio has been integrated into the instructional practices of 89 different faculty members (15% of the total UMD faculty) in all four colleges, as well as in leadership programs facilitated through the Student Engagement Office. This number is squarely in the middle of what Rogers (1995) called the "critical mass" needed to implement and sustain an innovation.

The ePortfolio even serves as a link between a local community college and the university, as the incoming transfer students who are part of the honor transfer program complete a class in which the ePortfolio is the tool used to represent student learning. Administrators did not prescribe any of these activities; instead, they all built upon positive past faculty experiences with the ePortfolio and required minimal staff resources to support and sustain the work. For these reasons, it is highly likely that the use of the ePortfolio in the university will continue even with the inevitable changes to software, faculty, and staff. The university staff and faculty support the ePortfolio as a reflective tool, and that appears to be the core requirement necessary to sustain the use of this technology.

While there are other case studies that illustrate how ePortfolios have been integrated into many different types of educational settings, there are very few that describe how integrative, reflective ePortfolios have originated and been sustained using a low cost, bottom-up model of implementation. It is our contention that this case study provides a rich and motivating source of information for those who want to employ ePortfolios in their institution.

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