

## Reflecting on Reflecting: Summer Undergraduate Research Students' Experiences in Developing Electronic Portfolios, a Meta-High Impact Practice

Karen Weber and Keri Myrick  
*University of Houston*

This pilot study assessed how using electronic portfolios (ePortfolios) as a meta-high impact practice (meta-HIP) might influence student learning through reflective practice. Eleven undergraduates participating in a summer research program reflected weekly on their research experiences through building and using ePortfolios, and attended three focus groups. The researchers assessed the students' level of engagement as a result of their weekly posts and studied how they used ePortfolios to enhance their learning. Results suggest that the students utilized their ePortfolios to communicate their enjoyment for their research projects as well as their increased knowledge and skills; make their learning more visible; track their achievements, which resulted in enhanced motivation; and demonstrate their pride in intellectual and personal growth. The students also appreciated the feedback they received on their reflections. As drawbacks, the participants believed that building an ePortfolio could be challenging in regards to designing the aesthetics, developing the appropriate content, securing the time for development, and using the website for the long-term. Consequently, the researchers found that a student learning community formed as a result of using ePortfolios as a meta-HIP. Nevertheless, for ePortfolio implementation to be successful, challenges pertaining to faculty adoption, resources, training, and scaling need to be addressed.

Through self-examination, students can find meaning in their educational experiences. Their learning process becomes knowable through reflective practice, leading to heightened confidence in their progress and abilities. For instance, students can differentiate between intended and actual educational outcomes and identify their individual learning strengths and preferences. As a result, reflective practice may increase and improve student engagement and performance.

Self-evaluation is a common way to assess HIPs, and institutions are increasingly turning to electronic portfolios (ePortfolios) to provide this type of assessment (Bryant & Chittum, 2013; Eynon, Gambino, & Török, 2014; Kahn, 2014). ePortfolios provide students with a tool to gauge their growth while participating in additional HIPs, such as community- and service-learning, and study abroad (Hubert, Pickavance, & Hyberger, 2015). Because of their well-documented "longitudinal capacity" (Eynon & Gambino, 2017, p. 205), as well as their portability and—with proper training—relative ease of use, ePortfolios demonstrate a holistic approach for showcasing students' personal and professional achievements in a wide range of media (Bowman, Lowe, Sabourin, & Sweet, 2016). Furthermore, using ePortfolios effectively can promote intellectual and personal growth by fostering reflection (Buyarski, 2014).

In addition to ePortfolios, faculty-mentored undergraduate research is also considered a high-impact practice (Kuh, 2008). Penny Light, Chen, and Ittelson (2012) identified HIPs as the most meaningful tools for gauging learning and suggest that ePortfolios pair widely with these types of activities. The researchers for the present study—administrators of co-curricular, high-impact programs at a large, top-tier research university in a diverse, urban setting—had quantitative data to show evidence of their undergraduate research students' gains

in retention. However, they had never qualitatively measured their students' level of engagement while participating in undergraduate research.

For this reason, the researchers created a pilot study in which undergraduates developed ePortfolios while conducting their summer research projects. The researchers explored whether using an ePortfolio as a means for students to reflect on their research experiences, employing *folio thinking*, might enhance student learning (Penny Light et al., 2012). Although ample studies examine the effectiveness of HIPs within higher education (i.e., Bonet & Walters, 2016; Jarmon, Traphagan, Mayrath, & Trivedi, 2009; Sweat, Jones, Han, & Wolfgram, 2013), we were more interested in the value of using ePortfolios to assess another high-impact practice: how might implementing ePortfolios as a meta high-impact practice (meta-HIP) aid students in reflection, and what might this type of reflection mean for their learning experience?

The cumulative and compensatory effects of ePortfolios (Watson, Kuh, Rhodes, Penny Light, & Chen, 2016) make them an obvious vehicle for tracking and assessing the impact of HIPs. Recognizing the potential benefit of employing ePortfolios as a meta-HIP—or using *folio thinking* to reflect on high-impact experiences—the researchers sought to measure the effect of student engagement for this particular cohort of undergraduate researchers (Watson et al., 2016). They also wanted to discern how emerging themes from the students' reflections related to this method of ePortfolio use (i.e., would these themes translate into achieving goals, identifying patterns in how they learned, and altering studying behaviors on shorter-term HIPs such as summer undergraduate research programs?). This

study answers the call for more empirical research on ePortfolios as a meta-HIP (Kahn, 2014; Kuh, 2017) and aims to further examine the ways in which ePortfolios enhance HIPs and inform pedagogy.

### Literature Review

Using ePortfolios to evaluate applied and collaborative learning is an effective practice (Kahn & Scott, 2013; Singer-Freeman, Bastone, & Skrivaneck, 2016). The present study sought to understand better the ways in which students can reflect effectively and find meaning while conducting undergraduate research. This literature review begins by defining reflection and describing the educational outcomes associated with engaging in reflective practice. Next, HIPs are defined and explained, followed by a discussion on tracking reflection through the use of ePortfolios. Finally, an explanation of the rationale for the study is presented.

### Benefits of Reflection

John Dewey's seminal work, *Experience and Education* (1938), firmly established the connection between reflection and education. Reflection can generally be thought of as "a process of turning experience into learning" (Boud, 2001, p. 10). For students of all ages and disciplines, engaging in the reflective process can translate into a wide array of educational outcomes. These outcomes include, among other things, increased self-awareness, clarity in communication, and valuable interpersonal skills (Copeland, Birmingham, de la Cruz, & Lewin, 1993; Eynon & Gambino, 2017; Penny Light et al., 2012; Reynolds & Patton, 2014; Rogers, 2001).

Engaging in reflection can also build students' confidence and ground deep learning in personal experience (Dewey, 1938; Kolb & Kolb, 2005; Penny Light et al., 2012; Reynolds & Patton, 2014). Concurrently, reflection assists students with setting and assessing learning goals and promotes problem solving, innovation, and critical thinking (Landis, Scott, & Kahn, 2015; Penny Light et al., 2012; Reynolds & Patton, 2014). Overall, reflection aids students in making connections between coursework and personal experience or across disciplines, courses, and programs (Peet et al., 2011; Reynolds & Patton, 2014).

To be effective, reflective practice requires scaffolding to support student engagement (Hatton & Smith, 1995; O'Keeffe & Donnelly, 2013; Reynolds & Patton, 2014; Ryan, 2013). Perhaps the most highly regarded reflective-practice model for HIPs is Kolb's (1984) Experiential Learning Theory. Kolb (1984) stated that students learn best by cycling through four stages: concrete experience, reflective observation, abstract conceptualization, and active experimentation

(Eynon & Gambino, 2017; Jarmon et al., 2009; Kolb & Kolb, 2005; Miettinen, 2000). As it supports student-engagement and a sound structure for learning and programming, Kolb's theory has been associated with student success and higher graduation and placement rates (Eynon & Gambino, 2017; Eyler, 2009). Finally, Kolb's theory provides a holistic view grounded in constructivism from which to evaluate knowledge (Peet et al., 2011).

### ePortfolios for Reflection

In order to discern how the students' reflections impacted their undergraduate research experience, the researchers were interested in observing the phenomenon of how students use ePortfolios as a tool for learning, goal setting, and recognizing educational patterns (Johnsen, 2012; Zubizarreta, 2009). For instance, would their learning from their summer research experiences extend into other areas of their education (Buyarski et al., 2015)? With guidance, could they make connections from one educational experience to another, hence employing integrated learning (Hubert, Pickavance, & Hyberger, 2015; Peet et al., 2011; Yancey, 2009)?

### High-Impact Practices

Study participants engaged in a full-time summer research experience, one of 11 high-impact practices. In 2008, George Kuh, along with researchers from the Association of American Colleges and Universities (AAC&U), identified 10 high-impact practices that promote deep learning and student success. These HIPs typically incorporate active learning, result in a heightened student commitment and increased collegiate retention and graduation rates, and often include a reflective component in implementation (AAC&U, 2013).

Subsequently, while developing Indiana University – Purdue University Indianapolis' scaling up efforts as part of the Connect to Learning project, Kahn and Scott (2013) recognized the potential of ePortfolios as a "meta'-high impact practice" (para. 30). ePortfolios, they argued, pair naturally with HIPs due to their capacity for improving the effectiveness of other practices, such as "first-year seminars, capstones, service learning, study abroad, and internships" (Kahn & Scott, 2013, para. 31). Eynon and Gambino (2017) built upon this notion, ultimately providing sufficient empirical evidence to persuade the AAC&U to recognize ePortfolios as the 11<sup>th</sup> official HIP (Kuh, 2017; Watson et al., 2016). Importantly, this inclusion marked the only addition to the HIP catalog in nearly 10 years (Kuh, 2017).

### Tracking Reflection

Frequently, methods of assessment for HIPs depend on self-evaluation and reflection. Effective

reflective practice requires student engagement, structure, and assessment. ePortfolios are a useful, broad-ranging tool for scaffolding reflection (Barrett, 2007; Eynon et al., 2014; Landis et al., 2015; Reynolds & Patton, 2014; Yancey, 2009); learning ePortfolios, specifically, have proven vital to measuring student engagement and observing the educational process (Barrett, 2007). Using learning ePortfolios can also bolster metacognition (Bokser et al., 2016).

Consequently, ePortfolios have become an increasingly popular tool for tracking and reflecting upon participation in other HIPs (Kuh, 2017). Specifically, ePortfolios provide students with a long-term, collaborative repository of HIP participation and analysis (Eynon & Gambino, 2017; Kahn, 2014; Penny Light et al., 2012). Recent research suggests that, when done well, ePortfolios' "accentuating effects" (Watson et al., 2016, p. 66) allow students to highlight specific instances of deep learning in a way that cannot be realized through transcripts, resumes, or even paper portfolios (Bowman et al., 2016; Kahn, 2014). For this reason, ePortfolios also illustrate to educational institutions and employers a collection of skills gained through curricular and co-curricular activities.

In addition, ePortfolios provide students with a platform for recognizing and articulating moments of discovery (Morreale, Van Zile-Tamsen, Emerson, & Herzog, 2017; Peet et al., 2011). The importance of the "aha" moment" students encounter when they realize that "learning how [they] learn *is [sic]* important" (Cambridge, 2007, p. 1) is crucial to their advancement through the learning and reflective processes. Through ePortfolio usage, students become more aware of their skills and abilities (Bowman et al., 2016). As a result, learning becomes more visible to students as they transition toward a more critical and intentional reflective practice (Eynon et al., 2014; Penny Light et al., 2012).

Undeniably, students benefit most when they can personalize learning (Penny Light et al., 2012). As students develop an aptitude for *folio thinking*, they begin to view their experiences and what they learned through the occurrences more consistently, thus gaining an appreciation for reflective practice and lifelong learning (Penny Light et al., 2012). Through mentored reflection, students gain valuable feedback, which is essential to student learning (Bowman et al., 2016; Eynon et al., 2014; Pearson & Heywood, 2004; Yancey, 2009). Through peer-to-peer feedback in forums, students build communities, providing a safe space in which to glean useful insight and new perspectives (Bowman et al., 2016; Hadley, 2007; Johnsen, 2012).

Furthermore, acknowledgment of accomplishments as well as constructive criticisms, when needed, helps students build confidence and take chances in unfamiliar areas of learning (O'Keefe & Donnelly, 2013). Regularly scheduled reflection activities—

including timely feedback—have a significant impact on student development of self-regulatory habits (Cheng & Chau, 2013; Johnsen, 2012). Likewise, they garner richer, more thoughtful reflections over time, as students can make modifications throughout the learning activity rather than awaiting a final assessment (Penny Light et al., 2012), when the opportunity for honing reflection skills might be lost (Bowman et al., 2016). For this reason, the researchers provided consistent feedback to the participants to ensure that they received the structure and support needed to make the most of their reflective practice.

Another benefit of using ePortfolios is that they enable students to "demonstrate their learning from the varied sites in which such learning occurs" (Watson et al., 2016, pp. 66-67). This makes ePortfolios an ideal tool for measuring knowledge and growth for undergraduate researchers, since their learning takes place in a wide range of locations and settings. This study assesses whether students make connections through reflection among their educational experiences, thus encouraging self-discovery, promoting metacognition, and heightening overall engagement (Bass, 2014; Drury, 2006).

### Rationale for Study

Kuh (2008) emphasizes the importance of students participating in more than one high-impact practice during their academic career, and empirical evidence suggests this is effective for student success (Brownell & Swaner, 2009; Morreale et al., 2017). Notably, the Connect to Learning project provides a comprehensive look at the benefits of conducting HIPs simultaneously (Eynon & Gambino, 2017; Watson et al., 2016), and this method of packaging HIPs has been found to have positive links to student engagement and retention (Morreale et al., 2017). For instance, in a longitudinal study conducted by Indiana University–Purdue University Indianapolis, Hansen, Graunke, and Thorington Springer (2016) found that students who participate in a thematic learning community while conducting service-learning have higher grade point averages and retention rates. However, few studies examine the impact ePortfolio implementation has on undergraduate research. The majority of the literature is assessment-driven (Bowman et al., 2016). In contrast, this pilot study investigates how employing meta-HIPs might increase engagement and impact students' articulation of achieving goals, identifying patterns in how they learned and altering studying behaviors.

### Method

This was a qualitative, phenomenological study (Patton, 2015). The investigation included reviewing

Table 1  
Participant Chart Including Academic Major, Classification, and Gender

Participant	Academic major	Classification	Gender
1	Biomedical engineering	Senior	Female
2	Biomedical sciences	Sophomore	Male
3	Geophysics	Senior	Male
4	Economics	Senior	Male
5	Electrical engineering	Senior	Female
6	Economics	Junior	Male
7	Architecture	Sophomore	Male
8	Biomedical sciences	Sophomore	Male
9	Psychology	Junior	Male
10	Marketing	Junior	Female
11	Computer science	Senior	Female

11 students' weekly reflections on their research experiences and collecting and analyzing their responses during three focus groups. The research team included two full-time staff members who were involved in collecting and coding qualitative data; a third staff member served as an observer to ensure the integrity of the research setting. One of the researchers transcribed the first of the three focus groups; an outside service transcribed the remaining two sessions. The software program Dedoose was used to store, code, analyze, and present the data. This active investigation raised questions about the data, which then was used to create categories and concepts (Corbin & Strauss, 2015; Strauss & Corbin, 1990).

### Location for Study

Staff associated with an undergraduate research office (the Office) housed within an honors college at a top-tier research university in Southeast Texas conducted this study. For over 13 years, the Office has served all undergraduate students at the institution and grown in size and scope each year to meet the needs of an ever-changing university population. Notably, the Office coordinates a wide range of programming to students from all majors. These programs include an early research experience for rising sophomores and juniors, a part-time semester research experience for juniors and seniors, a full-time summer research program for all continuing undergraduates, and a capstone thesis program for seniors.

### Participant Recruitment

The subjects for this study were recruited through their participation in the Office's full-time summer research program. This faculty-mentored summer research experience is a 10-week intensive program for approximately 80 rising sophomores, juniors, and seniors from all majors. Students receive a scholarship for

conducting research through the summer program. Participants were recruited for the study in-person during the program's late spring orientation, and again via email. They were made aware that their participation was entirely voluntary; their decision whether or not to participate would in no way affect their standing in the summer research program, and they could leave the study at any time. Initially, approximately 15 students volunteered to participate; ultimately, several declined to join the study before it began because of scheduling and timing constraints. One student, for similar reasons, dropped out of the study during week three.

### Participants

A total of 11 students participated in the entire study and represented a diverse range of ethnicities and majors—biomedical engineering, electrical engineering, biomedical sciences, computer science, geophysics, economics, architecture, psychology, and marketing. Table 1 describes the students by academic major, classification, and gender. Only one of the 11 participants had previous experience building a website of any kind; none of the students had ever developed an ePortfolio.

### Focus Groups

The 11 ePortfolio students met with the researchers a total of three times during the study to participate in focus group interviews. The researchers asked open-ended interview questions, and as a result, garnered rich, descriptive responses from the participants (see Appendix). This enabled the researchers to gain a deeper understanding of the students' experiences using ePortfolios (Patton, 2015). The first of three focus groups was audio recorded, and observational notes were taken by two individuals during the interviews: one researcher and an additional observer approved by

the University's Institutional Review Board. Focus groups two and three included the second researcher.

The meetings aligned with the timeline for the 10-week summer research program. The ePortfolio participants met once during Week 2, once during Week 6, and once during Week 10. A workshop on how to develop an ePortfolio comprised much of the first meeting. One of the researchers presented a website built in Wix as an example of an ePortfolio, and she showcased other students' Wix websites as exemplars. While the majority of the participants built their websites in Wix—the digital platform utilized in the university's ePortfolio class—the architecture student opted to work in WordPress because this was a platform he had used before and it offered optimal customization.

This study did not require students to use a specific template, as the purpose of the study was focused on the value of the process, not the final product. In addition to learning how to use the technology, students also addressed the purpose, audience, and goals for their ePortfolios by completing a goal chart. The students' responses to open-ended interview questions allowed the researchers to gauge several items: the participants' expectations of building an ePortfolio, level of interest in developing the website, concerns regarding potential challenges within the process, and students' plans for how they would use their websites.

During the final two sessions, questions pertaining to students' progress in developing their websites and how they were using them informed the discussion. Specifically, the researchers asked students about any challenges in developing their sites, what they learned from using their ePortfolios, and their level of interest in building their websites. These group interviews also provided an opportunity for students to share their websites with one another and engage in valuable peer feedback on each other's ePortfolios. The third focus group asked students to assess their overall experience using an ePortfolio throughout the summer, and solicited responses on the advantages and disadvantages of developing a website while conducting a full-time summer research project. At the end of the program, students who chose to publish their sites had the opportunity to share their finished products with the other participants, which was outside the study's parameters.

### Prompts for Participants

In addition to attending three group interviews, the participants were asked to reflect and write each week, using prompts, about their research experiences. If their ePortfolios were not developed, students submitted links to or screenshots of their ePortfolios or text documents. The reflective prompts included the following:

- What was the most interesting task you completed this week?
- What was the most challenging issue you encountered this week?
- How might these experiences positively or negatively impact your summer research project?
- Has your perspective on your research project changed? If so, how?

### Data Analysis

For the present study, it was essential that the data analysis parallel the inherent dynamic nature of ePortfolio creation. The researchers used Heinrich and Rivera's (2017) model for high-impact and experiential learning assessment (HELA) as a method for analyzing the students' weekly reflections. Heinrich and Riviera developed HELA with the notion that student reflections should be assessed through embedded outcomes or through an inductive process. Therefore, the assessment of the data employed inductive open coding rather than using a deductive approach in analyzing the findings. The AAC&U Creative Thinking VALUE rubric (AAC&U, 2009) supported the identification and description of the codes developed by the researchers.

The process of analyzing the transcripts from the three focus groups included identifying common themes and insights derived from the interviewees' responses to questions pertaining to ePortfolios. The research questions were answered through in-depth group interviews, as well as through observational notes. These responses were then compared with the students' weekly ePortfolio reflections using triangulation. Intercoder reliability was employed when coding the weekly reflections submitted by the students and when analyzing the results of the study. Through this process, subthemes and then dominant themes were identified.

### Results

Before the study began, the majority of the participants expressed a strong desire to have a platform to organize their curricular and co-curricular experiences and artifacts. Most considered simply learning how to create a website a desirable skillset to hone. Participants expressed at the start of the study a deep interest in using the ePortfolio both as a tool for learning—collecting, organizing, and reflecting on their summer research experience—and as a medium for marketing and promoting their achievements to potential employers, faculty mentors, and graduate and professional school admissions committees.

Whereas some students built fully developed websites early on in the process, the majority of the students solely used their ePortfolios for posting on their

summer research experiences. Nevertheless, most of the students communicated their intent to ultimately use the tool to showcase additional involvements, such as academics, hobbies, and leadership and organizational activities. By the conclusion of the study, about one third of the students did “go live” with their ePortfolios and included content presenting their academic and professional highlights. Several participants discussed their plans to parlay their current work into longer-term ePortfolio use through adding tabs on the navigational bar and other integrative processes and to go live with their sites before they graduated.

While study participants saw value in creating ePortfolios and their potential for future use, some reported putting reflections and website creation second to their commitment to their research. Others, imposing on themselves accountability for the weekly reflections, became less concerned with aesthetics and focused primarily on that component of ePortfolio use. This poses a concern with regard to long-term implementation and should be addressed for future programs to be effective.

### Dominant Themes

The most dominant themes that emerged when analyzing the students’ weekly reflections and the feedback received from the interviews included: communicating enjoyment of project and increased knowledge and skill sets, making learning more visible, tracking achievements resulting in enhanced motivation, demonstrating pride in intellectual and personal growth, and sharing appreciation for feedback received on their weekly reflections. Challenges communicated by the participants included: developing a website that was aesthetically pleasing, the time involved in creating a website, the appropriateness of ePortfolios for all students, and the viability of long-term use of the website.

**Communicated enjoyment of project and increased knowledge and skill sets.** Students commonly used their ePortfolios to express optimism or excitement about their research projects. They used the online platform to discuss how they were acquiring new skills, using innovative equipment or software, and addressing learning curves within their projects. Many perceived their websites as a demonstration of self, and as an outlet for creativity and communicating more effectively about their research experiences. For instance, students wrote the following comments: (a) “This is just the start of the data analysis I have to do; however, it is fun, exciting, and full of new surprises” (Student #6, Reflection 2); (b) “There were several delays this week but in the end, we were able to create a process that will make data processing go easier for both us and for future teammates” (Student #5,

Reflection 2); and (c) “It has helped me rekindle my creative touch that I had when I was younger, but lost when I went to college” (Student #10, Focus Group 2).

**Made learning visible.** The students used the tool to make their learning more visible. At the beginning of the study, the students relied heavily on the prompts, but as the weeks progressed, their responses evolved into sharing their own experiences outside the prompt. They began making connections within their learning. They used the online platform as a means to think deeply about their projects and consider the broader picture of their research. The students also took time to reflect on how this summer experience might have a greater impact in the years to come. They consistently recognized the opportunities for increased understanding that arose through conducting research, and grew to value their projects. The students did not shy away from acknowledging the problems and challenges encountered along the way, but more often than not, they would suggest a potential solution in an effort to keep the project moving forward. Students noted the following: (a) “I can look back to [the reflection essays] and say, ‘Oh, wow. It was hard back then. But now I mean I got to the end result pretty easily’” (Student #3, Focus Group 2); (b) “It helps me see what I’ve done and then look ahead to what I want to do” (Student #5, Focus Group 2); and (c) “I can see what I did wrong, or I can see that the steps kind of followed before to try to approach problems, and so that’s what I’m kind of using as a journal” (Student #2, Focus Group 2).

**Tracked achievements resulting in enhanced motivation.** In addition to using the ePortfolio as a tool for reflection, students appreciated the ability to continually record their accomplishments. This tracking also bolstered time efficiency, acting as an online to-do list, and allowed the ePortfolio to serve as a repository for academic and professional achievements. Over time, the students also became more cognizant of performing activities they could ultimately include within their ePortfolios. Thus, their ePortfolios resultantly served as a tool that heightened their motivation. Indeed, the students’ responses highlight the multifaceted purpose of ePortfolios as a means for self-assessing progress, storing work, and sharing accomplishments with an external audience. One student explained, “I would say it kind of motivates me because if there’s nothing that I can write about, then I feel it means I didn’t do much this week” (Student #11, Focus Group 2). Another student said,

So what this site has kind of allowed me to do is in the beginning . . . you have a list of what you’ve done. So before I go and speak about anything that requires me to speak about what I’ve done, I’m able to look at that, and it gives you a refresher. (Student #6, Focus Group 2)

A third student noted,

It's made me think more about how I'm using my time because now I'm always thinking OK, if I do this I'll be able to put it on my website, but if I you know watch Netflix, I'm not going to be able to put that on my website. So it's made me think more about how can I use my time wisely developing new skills and learning new things. (Student #8, Focus Group 2)

**Demonstrated pride in intellectual and personal growth.** As a result, the process of developing ePortfolios boosted students' confidence. The students' reflections often shared their satisfaction in what they produced or achieved, expressing their excitement and optimism regarding their projects, as well as their increasing abilities as researchers. They were able to review their progression over the course of 10 weeks and thus take pride in their intellectual growth. They demonstrated recognition of their enhanced personal responsibility, independence, and ability to see a task to fruition as a result of their research projects. Through this experience, some participants grew to appreciate the practice of reflection. For instance, students wrote: (a) "I am so happy this week!! I believe that I have achieved a breakthrough in my research that finally I am seeing the patterns in the data sets" (Student #11, Reflection 6); (b) "This is also a great learning experience as a young researcher because it teaches me that I am responsible for the data I produce" (Student #11, Reflection 3); and (c) "I've learned more of the importance of reflection as a whole" (Student #3, Focus Group 3).

**Shared appreciation for feedback.** The participants enthusiastically expressed their appreciation for the feedback they received each week. They were pleased to have the opportunity to share consistent updates on their research with someone outside their field. They also knew they were not posting updates in a vacuum—someone was on the receiving end, reading and replying to their responses. All participants were supportive of future undergraduate researchers reflecting on their research and developing an ePortfolio (provided someone would respond to their reflections). They were all also amenable to sharing their reflections and websites with their faculty research mentors. For example, one student explained, "I think the more eyes you can get on [your reflections], whatever you're trying to say, is always beneficial" (Student #7, Focus Group 3).

**Expressed challenges.** The most commonly expressed challenges included the difficulty of building an aesthetically pleasing website and the amount of time required to develop the ePortfolio. Finding the appropriate balance between sharing professional and personal information also was a noted barrier. The ability

or need to be creative when developing the websites was perceived by some students as a positive and by others as a pitfall. It was easier for the students to post and reflect on their research experiences because they were fully immersed in their projects, as compared to sharing information on their other activities outside the summer research program. There was also some concern about how they would use the ePortfolio after their summer experience. All of the participants found reflecting on their research experiences or developing an ePortfolio to be useful, but recognized that not all students may embrace this tool for reflection. For instance,

I don't think something like this is useful for everyone . . . I think we are a specific group of people that wanted to do this and committed to putting in the time and effort to work on it and make it good. But I don't think that this would be something everybody would want to put their time and efforts towards . . . But for us, it is productive. (Student #10, Focus Group 2)

Therefore, it is clear that the students took full advantage of using their ePortfolios to post the highlights of their research projects. They used the medium as a means of acknowledging setbacks and then outlining ways to progress forward, hence supporting Kolb's (1984) theory and the AAC&U Creative Thinking VALUE rubric (AAC&U, 2009). By making these connections with their educational experiences, they are actively engaging with their experiences through reflection, fostering lifelong learning, and promoting a growth mindset.

### Implications of Study

These findings have several interesting implications within the field of collegiate high-impact practices and ePortfolios. To begin with, the students bonded while participating in the study. As the students began to discuss their experiences with building out their websites, they realized they shared the same highs and lows. Although they were working on independent research projects from disparate fields of study, they formed a community through sharing experiences of building their websites. They discussed their discoveries and frustrations with using the technology, hence benefiting from each other during the focus groups. The participants were also amused that they were not alone in using the ePortfolio as a motivational tool to ensure that they would have content to include in their website each week. Student researchers can feel isolated when conducting their projects; they often work independently and can struggle with staying focused and on task. Creating learning networks or communities can address this prevalent issue.

Next, the participants greatly appreciated the responses they received from one of the researchers each week on their reflective posts. This consistent feedback regarding their research experiences addressed some concerns commonly associated with undergraduate programs of this type. For example, the Office frequently receives complaints from undergraduates that they can feel inexperienced and overwhelmed when conducting research. Yet being able to convey their feelings through responses to prompts, and to receive comments from the administrator, likely improved their ability to work through issues encountered in the research setting. Despite setbacks, they recognized their increasing abilities as researchers, as well as their enhanced capacity to effectively communicate about their projects to others.

### **Ramifications of Implications**

Successful ePortfolio implementation requires ample time and support (Johnsen, 2012). Undoubtedly, large-scale implementation by a single instructor would be an unrealistic expectation. Effectively supporting larger groups of students requires an organized, scaled effort. For departmental or institutional ePortfolio adoption, faculty buy-in, training, and resources are critical (McWhorter, Delello, Roberts, Raisor, & Fowler, 2013). For instance, the process of reviewing and responding to students' posts is extremely time consuming. To address this, ePortfolio facilitators could ask students to reflect and post regularly while participating in their high-impact practices, but might be selective in how many times they reply to students' posts. Peer-to-peer feedback might also shift the onus from the instructor and provide more meaningful, robust commentary on which aesthetic- or content-focused responses could be shared. Consequently, during the final focus group, the participants expressed an interest in sharing their postings and working with each other, so this may be a viable option. One student said, "From the very beginning, it would have been helpful . . . maybe even just make a Dropbox account with everybody's links to their websites just so we can kind of bounce ideas off each other" (Student #7, Focus Group 3).

The participants were also grateful for the instruction they received on how to build an ePortfolio, particularly before they embarked on the development process. Students need theoretical and technological guidance when developing their websites (Johnsen, 2012; Watson et al., 2016). If the instructor or program coordinators do not possess this skillset, someone who is knowledgeable about ePortfolio theory and practice should be consulted. This individual should be available to provide support to students throughout the ePortfolio process. For instance, one participant mentioned the challenge associated with defining the particular

audience for his ePortfolio, a theoretical issue that is crucial to students' success in their ePortfolio development. The students need assistance on what they should include in their websites, why they should include this content, and finally how actually to build ePortfolios (Johnsen, 2012).

For large-scale adoption, incentives are also essential for success. This can be accomplished through institutional rewards for the use of high-impact practices through academic promotion and tenure. In addition, asking faculty to develop ePortfolios when uploading their CVs and other materials for promotion may invoke increased adoption for the tool. Faculty who have personal experience with ePortfolios may be more inclined to include them in their curriculum and pedagogy within the classroom (Bowman et al., 2016). The researchers feel it is worthwhile for institutions to work through these issues, as it is critical that our 21<sup>st</sup>-century learners have "more opportunities to reflect on, synthesize, and demonstrate the knowledge and skills they are gaining both within and outside of the classroom" (Peet et al., 2011, p. 21).

### **Limitations of Study**

Limitations pertaining to this pilot study arose. To begin with, the pool for participant recruitment comprised motivated students who received scholarships to conduct research. The students who developed ePortfolios self-selected from this pool to serve as participants. Thus, it could be argued that by volunteering for the study, these students were already more likely to be engaged. While this may be true, it does not change the fact that the students did use their ePortfolios as a tool for making connections with their learning. Nevertheless, testing this model on two sample populations would be prudent. A future study might explore two cohorts—one group who receives scholarships for creating ePortfolios and a second group who does not receive compensation.

Furthermore, this pilot study only included 11 students, which was approximately 13% of the program's entire summer research student population. Subsequently, these findings are not indicative of the program's total cohort of summer researchers. Participation in the pilot study was optional, as there were over 80 students in the entire summer research program; the researchers opted for working with a smaller sample size to allow for deeper analysis and more detailed feedback to the participants. In addition, although the participants' majors, classifications, and genders varied, there were no obvious differences noted in the content and caliber of their reflections. Perhaps if the sample size were larger, distinctions pertaining to field and whether the student was a sophomore or senior would become more obvious (see the Potential

Future Studies section). Broader analyses should include a larger sample population.

Also, since one of the researchers was the coordinator of the summer program, there could have been a desire by the students to please the researcher. As a means of addressing this concern, the students were told and reminded that their participation was voluntary and would have no bearing on their status in the summer program. The participants were also encouraged to be authentic within their reflective submissions. Finally, to prevent bias on the part of the researchers, inter-coder reliability, as well as Heinrich and Rivera's (2017) HELA model, and the AAC&U Creative Thinking VALUE rubric were used (AAC&U, 2009).

### Potential Future Studies

The findings from this study suggest potential for future analyses. It would be interesting to learn whether the researchers would receive similar results if all the students in the summer research program were required to submit weekly reflections. There may be commonalities discovered within academic majors and students' classification. Another interesting analysis might occur if students, in addition to submitting weekly reflections, could share their submissions with each other and comment on each other's posts. The establishment of a peer-to-peer forum might promote further a sense of community among the participants, alter what students choose to post, or aid students in recognizing learning processes earlier on through group discussions (Bowman et al., 2016; Hadley, 2007).

Additionally, assessing these results in light of studying another one of Kuh's (2008) high-impact practices through this same lens might be prudent. Whereas this investigation used ePortfolios to analyze the learning of student researchers, an additional inquiry could employ ePortfolios to study the outcomes of students participating in internships, service learning, or study abroad experiences. Adding supplemental measurement tools, such as a pre-post survey, would also add depth to this analysis.

### Conclusion

This study allowed for the researchers to gain in-depth, qualitative information on the progress of a select group of student summer researchers. Garnering information from students while their educational experiences were taking place in real time was enlightening. The ePortfolios conveyed how the students were answering their research questions, grappling with their projects, and developing relationships with their faculty mentors. Just as students prosper from opportunities for self-reflection to guide their educational path, faculty and staff also benefit

from analyzing the learning outcomes and experiences of students. Studies in this vein are pivotal for administrators to understand better the dynamic needs of 21<sup>st</sup>-century learners and to make necessary refinements to program delivery and assessment.

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- KAREN WEBER, EdD, Assistant Dean of Co-Curricular Programs at the Honors College, University of Houston, has served as an administrator within honors education for over 13 years. Currently, Karen supports co-curricular and experiential learning opportunities within the Honors College. Her portfolio includes working with staff and faculty to develop, coordinate, and evaluate experiences that complement the curriculum, including undergraduate research, service learning, and nationally competitive scholarships. She is also overseeing a grant from the Andrew W. Mellon Foundation to establish an undergraduate research program in the humanities. She manages the Honors ePortfolio program and teaches an ePortfolio course at the university. She enjoys consulting with faculty and staff across the university on incorporating ePortfolios into their academic programs. Karen's research interests include analyzing ePortfolios for student learning, advising, and preparing students for the workforce as well as studying co-curricular programs, high-impact practices, and experiential learning opportunities within higher education. She has presented at AAEEBL on using ePortfolios to prepare students for the 21<sup>st</sup> century workforce and integrating ePortfolios into the university. Karen has received four university-wide staff awards during her tenure at the University of Houston.
- KERI MYRICK is pursuing a PhD in Higher Education Leadership and Policy Studies at the University of

Houston. Her current research considers the relationship between high-impact/experiential-learning (HIEL) activities and persistence in historically under-represented minority student groups. Her other interests include identity development in undocumented student populations, reflective practice and personal accountability, and HIEL approaches with students of low socioeconomic status. Ms. Myrick recently presented at the Association for the Study of Higher Education's Annual Conference on *The Promise of Experiential Learning for Disadvantaged Populations*. In her role as Director of Special Programs in the Honors College, Ms. Myrick serves on the Committee for Study- and Service-Abroad/Away in the Honors College and is the faculty adviser for several co-

curricular programs, including Model Arab League and Model G20-Summit. She has participated in three research fellowships to the Middle East, where she examined public K-20 education in Bahrain, Qatar, Oman, and the United Arab Emirates. Ms. Myrick is also the director of the University's Phi Beta Kappa and Phi Kappa Phi chapters, liaison for the Honors College Advisory Board, and former chair of the Staff Council's Events Committee.

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Appendix  
Focus Group Questions

**Focus Group - Session One**

The majority of the first session comprised a guided tutorial on how to build an ePortfolio.

1. Do you have prior experience building a website?
2. What are your expectations for building and using an ePortfolio this summer?
3. What do you anticipate will be challenging?
4. What do you anticipate will be valuable or beneficial?
5. How do you plan to use your ePortfolio *during* the summer research program?
6. How do you plan to use your ePortfolio *after* the summer research program?

**Focus Group - Session Two**

1. How are you using your ePortfolio?
2. What are you uploading on your website in addition to what you have shared with me each week?
3. What have you learned from using your ePortfolio?
4. What are the benefits of building an ePortfolio?
5. What are drawbacks of using an ePortfolio?
6. Thus far is this a useful tool. If so, how is it useful? If not, why?

**Focus Group - Session Three**

1. Overall, how would you assess your experience in building an ePortfolio?
2. What have you learned from using your ePortfolio?
3. What are the benefits of building an ePortfolio?
4. What are drawbacks of using an ePortfolio?
5. What did you learn about yourself through developing an ePortfolio?
6. What did you learn about your research through developing an ePortfolio?
7. Was there anything you gained from building and populating your website that you would not have learned otherwise?
8. What is the value of reflection?
9. How was using a digital platform for reflection more or less beneficial than in-print journal writing or sketch booking?
10. Would you have liked an opportunity to share your reflections with the other participants throughout the study?
11. Would you recommend other students build a website while conducting research? Why or why not?