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Making Student Learning and Experiences Evident in General Education With ePortfolios: A Programmatic Evaluation

Virginia Ann Coleman-Prisco
Mercy University

For over almost decade, Mercy University's faculty have been integrating ePortfolios into general education seminar courses, which have empowered students to archive work, demonstrate growth, share diverse experiences, and reflect upon their identities as lifelong learners. This paper features a five-year-long program evaluation with findings that illustrate the value of scaffolding reflective ePortfolio assignments into the general education curriculum with the goal of enabling and assessing intellectual growth. These findings are centered on a preliminary phase of ePortfolio use in the first-year and capstone general education seminar courses. Based on the survey data collected, faculty perceptions and usage of ePortfolios improved over the five-year period regarding student learning and success. Recommendations include learner-centered institutional change through an ePortfolio supported redesigned general education curriculum.

Guided by Eynon and Gambino's (2017) Catalyst Framework, this evaluation sought to answer two central questions. First, how did faculty perceptions of ePortfolios' impact on student engagement, learning, and reflection change over a five-year period of implementation? Second, what evidence of learning and growth do students themselves demonstrate through their ePortfolio reflections? The analysis revealed that faculty perceptions improved significantly, with more instructors reporting ePortfolios were effective for student reflection and learning in 2023 than in 2019. Furthermore, qualitative analysis of student ePortfolios provided compelling evidence of metacognition, skill mastery, and personal development, particularly at the capstone level. However, a main challenge was the lack of significant improvement in faculty-reported ease of use of the technology, highlighting a critical area for future support and development. The findings also indicate that despite persistent technological challenges, ePortfolios significantly enhance faculty perception of student engagement and provide powerful evidence of students' academic and personal growth, offering critical insights for the institution's ongoing general education reform and underscoring the value of ePortfolios as a tool for learner-centered institutional change.

In an era focused on demonstrable student learning outcomes, electronic portfolios (ePortfolios) have been promoted as a high-impact practice (HIP) for their ability to make student growth visible through reflection and integration. This programmatic evaluation investigates the efficacy of a longstanding ePortfolio initiative within the general education curriculum at Mercy University, a Hispanic-serving private institution in New York. Through a mixed-methods analysis of longitudinal faculty survey data and qualitative student ePortfolio artifacts, this study examines if and how ePortfolios succeed in making student learning and experiences evident across first-year and capstone courses.

Literature Review

Over 125 years ago, Harvard President Charles Eliot proclaimed that "Our schools and colleges have been trying to prepare their pupils for a subsequent life out in a world which has itself been shifting and changing with an unprecedented rapidity" (Eliot, 1903, p. 63). Eliot recognized that the reality American schools prepare students for "is an utterly different life from that for which the schools were preparing the children forty years ago—or even twenty years ago" (p. 63). President Eliot was describing a shift in the character of American life that began in the mid-19th century, largely due to rapid technological change. He went on to identify such inventions as the telephone, telegraph, steam engine, and electric light as some of the revolutionary technologies of his time from which "immeasurable benefits have flowed," arguing that schools had to change to keep up with changing times (Cassidy, 2004). Educational institutions in the 21st century must continue to adapt to rapidly changing technologies that impact the teaching-learning process, such as learning management systems and electronic portfolios (ePortfolios).

The advancement of electronic portfolios did not transpire in a void; rather, they descend from reflective print portfolios that have been traditionally used in certain disciplines such as college-level writing, nursing, and teacher education (Kahn, 2014). Three "revolutions" have supported the integration of ePortfolios. According to Wickersham and Chambers (2006), the technological revolution offered the technical tools and strategies to facilitate ePortfolio development, the assessment revolution recognized better approaches to identify, measure, and evaluate student learning, and the active learning revolution advanced more student-centered versus teacher-centered approaches. Many advocates of reform suggest that technology calls traditional faculty instructional

roles into question. In the traditional model, instruction is professor-centered with students in a secondary, often passive, role. Fuller integration of technology such as ePortfolios into college classrooms may eventually convert the college professor from a "sage on the stage" to a "guide on the side" with modification of teaching approaches through the instruction of cooperative or collaborative student-centered learning (Cassidy, 2004). As guides, not judges, instructors can use learning platforms such as ePortfolios to show students how to engage in the practice of student-centered learning. An alternative way to view the approaches is to recognize how ePortfolios distinguish a shift from a "teaching paradigm" to a "learning paradigm" (Kahn, 2014).

In creating ePortfolios as undergraduates, students will develop the ability to converse with others about their interactions with educational attributes such as critical thinking, inquiry, autonomy, and communication across diverse topics in liberal education. They will develop the ability not merely to criticize values, but to add value to multiple organizations in which they participate (Roth, 2013). The liberal arts and general education remain contentious topics in a country committed to technological change as an engine for economic development. Liberal education has also been connected to the increased freedom and autonomy of the individual, and to enhancing the capacity of people to engage in meaningful work. However, liberal education has always included a strong historical function, giving students access to the great intellectual, scientific, cultural, artistic, and political achievements of the past while developing specialization in one or more areas (American Association of Colleges and Universities [AAC&U], 2015; Roth, 2013). AAC&U is the principal organization in the United States that is charged with advancing the quality and strength of liberal education through pursuing excellence in undergraduate education by focusing on facilitating the foundations of equity, access, and quality regardless of academic discipline or career paths of students (AAC&U, 2015). Besides traditional academics, a liberal education gives a sense of social duty, as well as strong, transferable intellectual and practical skills such as communication, analytical, and problem-solving skills, and a demonstrated ability to apply knowledge and skills in real-world settings through a core general education curriculum (AAC&U, 2023).

To support innovation and social duty in liberal education, in 2005 AAC&U launched the Liberal Education and America's Promise (LEAP) initiative. Through national public advocacy and campus action in liberal education, LEAP supports individual students via identified HIPs (Kuh et al., 2013; Schneider, 2021). One such HIP is ePortfolios. Portfolios have a foundation in the visual and performing arts. Traditionally, in education, portfolios are binders or folders containing a student's best pieces along with the student's evaluation of the strengths and weaknesses of the pieces (Sweet, 1993). In 1979, Eugene Williams wrote about how student teachers at Howard University were using portfolios with audiovisual materials such as slide narrations and audio-videotape recordings to replace resumes when seeking employment (Williams, 1979). Since then, the graduate-level teacher education field has not only widely embraced the use of portfolios, but the trend has moved into the undergraduate liberal education field in the form of ePortfolios.

Some key drivers to the use of ePortfolios in liberal education as a HIP are due to several key elements that contribute to enhanced learning outcomes and student development such as reflection, integration of learning, and enriched communication through showcasing academic work. In undergraduate education, ePortfolios have been proven to encourage students to engage in reflection and self-assessment, allowing them to critically evaluate their learning and growth over time (Barrett, 2007). This reflective process helps enhance self-awareness, self-assessment, and deepen learning. ePortfolios also assist in the integration of learning across different outcomes, courses, and experiences. Students showcase their academic work, demonstrate how they apply knowledge and skills from various contexts, and take ownership of their learning by choosing which artifacts to include and how to present them, which supports a full vision of their educational journey (Payne et al., 2020; Kuh, 2008). ePortfolios also follow evidence-based teaching practices that recognize diversity in students' learning, identities, and communities by allowing space for personal expression. According to Lehman et al. (2021), when students use ePortfolios for self-directed learning and reflection over their entire general education curriculum, a deepened understanding of the student experience occurs, and the process of integrative learning is visible. As faculty facilitate students' expression of learning through ePortfolios, the process becomes student-driven, organized, visible, and accessible all in one space (Karami et al., 2019). When students are encouraged to connect general education outcomes to lifelong learning in ePortfolios, they recognize that this tool serves not only as an archive of experiences and evidence, but that it can benefit students' careers by providing visible examples of their ability to collaborate, navigate cultural diversity, and show their skills (Schrand & Tulante, 2022). McAlpine (2005) described a central constructivist paradigm of "ePortfolio as story," and how this tool enables students to explore concepts of identity, particularly concerning authentication when they create their own narratives within the ePortfolios. These drivers collectively mark ePortfolios as a HIP by promoting deeper learning, personal development, and enhanced communication through the practical application of skills that contribute significantly to the student's overall educational experience.

One way that higher education institutions address issues such as student retention and first-year

experiences is by requiring students to complete first-year seminars. High-quality versions of these courses have a robust emphasis on skills that advance students' academic competencies in critical inquiry, information literacy, writing, and collaborative learning (Kuh, 2008). Both community colleges and four-year institutions use similar models. Martin (2013) related how a faculty team incorporated AAC&U's HIP by designing a first-year seminar linked to general education learning outcomes and showcased this collaborative model through students' ePortfolios. These ePortfolios used formative reflections to provide evidence of how students were competent in the learning outcomes and how they were learning (2013).

Prior research that is similar to this programmatic evaluation includes that of Salt Lake Community College and Chattanooga State Community College which used ePortfolio to scaffold student learning throughout the college experience by giving students ownership of their education (Hubert et al., 2015). Also, at Clemson University, a four-year institution, their program required all students to create an ePortfolio in their first year to evaluate the general education program by submitting the ePortfolio as evidence of experiential and academic mastery of the general education competencies (Ring & Ramirez, 2012). This was a long-term endeavor that followed students from their first year to degree completion. Additionally, eight colleges and universities took this concept one step further stemming from the LEAP Challenge initiative and committed to curricular change that incorporates signature work to enhance student learning to ensure their strong liberal education programs were fully demonstrated in every student's educational experience (Hayden-Roy et al., 2018). A *signature work* refers to an academic project or activity that students produce to demonstrate their learning and capabilities, to showcase the knowledge, skills, and competencies that they have developed throughout their degree program. The collective found that success with incorporating signature work depends on how institutions can nurture new ways of thinking, build, and embed the process throughout the campus community, and internalize the changes in institutional systems of learning supported by a feedback cycle of institutional assessment and careful monitoring of the new curriculum (2018). These initiatives show how this program evaluation is aligned with curriculum and technology integration across the United States and with AAC&U's HIPs.

Theoretical Framework

In 2017, Eynon and Gambino published a collection titled *High-Impact ePortfolio Practice: A Catalyst for Student, Faculty, and Institutional Learning.* In the volume, they theorized three "Value Propositions" of supporting reflection, integrating deep learning, and catalyzing learning-centered institutional change that encourages ePortfolio success (Eynon & Gambino, 2017). Building off their previous work in 2014 and Kuh's (2008), through a collection of case studies Eynon and Gambino (2017) developed the Catalyst Framework which outlines the following components for successful ePortfolio use: integrative social pedagogy, professional development, outcomes assessment, technology, and scaling up. Each of the components scaffolds what should be in place to launch, build, and sustain a "high-impact" ePortfolio practice that deepens student learning, improves student success, and catalyzes learning-centered institutional change (2017). The following program evaluation uses Eynon and Gambino's Value Propositions and Catalyst Framework to guide the research questions and findings regarding making student learning and experiences evident with ePortfolios.

Program Evaluation

Problem Statement

The purpose of this programmatic evaluation is to determine if and how ePortfolios made student learning and experiences evident throughout the undergraduate curriculum, specifically throughout general education.

Background

Mercy University is a four-year private liberal arts college located in the heart and suburbs of New York City. Mercy was the first Hispanic-serving institution in New York State to receive the Seal of *Excelencia* from the *Excelencia* in Education organization, as well as the largest private Hispanic-serving institution within 1,000 miles. As of 2023, the full-time undergraduate enrollment was 8,615, with 72% female and 28% male. For over a decade, Mercy University's faculty of the general education seminar courses have been integrating ePortfolios, which have empowered students to archive work, demonstrate growth, share diverse experiences, and reflect upon their identities as lifelong learners. This research features longitudinal findings that illustrate the value of scaffolding reflective ePortfolio assignments into the general education curriculum to enable and assess intellectual growth by helping students make meaning of their learning experiences through reflection. These findings are based on a preliminary phase of ePortfolio use in the first-year and capstone general education seminar courses.

Critical Inquiry (CINQ101) is a three-credit first-year general education course that introduces and reinforces reading fluency, critical thinking, and information literacy among all first-year students at

Mercy University (and transfer students with 30 credits or fewer). These competencies, plus oral communication, writing, and quantitative analysis are later assessed in the three-credit Junior Seminar (JRSM301) capstone, which is also required for all Mercy University students prior to graduation. The JRSM301 capstone is a course where students are expected to reflect upon how they have arrived at milestones in their academic journey, take inventory of their strengths and opportunities for improvement among the general education skills, and focus on ways they can continue to nurture their intellectual growth and evolving identities as lifelong learners.

The ePortfolio practice is scaffolded into the curriculum in these two courses. In CINQ101, the ePortfolio is introduced as a digital archive and a tool for foundational reflection. Students are typically prompted to upload key assignments and write brief reflections on their initial college experiences, focusing on the development of core competencies such as critical thinking and information literacy. This establishes the ePortfolio as a continuous record of their academic journey.

The practice deepens considerably in JRSM301, where the ePortfolio shifts from an archive to a curated showcase of growth and integration. Students are required to reflect on their entire undergraduate experience, select artifacts that best demonstrate their mastery of general education outcomes, and write sophisticated, meta-cognitive narratives that synthesize their learning across courses and disciplines. This structured progression, from collection in the first year to curation and synthesis in the junior year, ensures the ePortfolio evolves alongside the student, making their intellectual development visible to themselves and the institution.

Methodology and Programmatic Evaluation

Program evaluation involves gathering and analyzing data related to the educational program's design, implementation, and outcomes with the aim of monitoring and assessing its value (Al Sinani & Al Naamani, 2021). Historically, most of the attention has been focused on academic program development and implementation; research and evaluation in education have transformed into a practice-based science over the past few decades (2021). Assessment cycles and evidence-based practices reinforce the importance of program evaluation.

For this program evaluation, data were collected through one survey sent twice over a five-year period to instructors intended for program review regarding ePortfolios and through collecting anonymized student writing samples from published ePortfolios. The surveys were distributed to 33 adjunct and three full-time instructors in the Academic Year (AY) 2018–2019 and 23 adjunct and two full-time instructors in AY 2022–23 from Mercy University using a Google Form (as seen in Appendix A). These instructors taught the two general education seminar courses, CINQ101 and JRSM301 during those two academic years. The instrument included three sections: (a) name and course assignments; (b) Likert-scale items on the impact on student learning, the impact of reflections on the students' ability to read and think critically, write and speak effectively, and exercise information literacy and quantitative analysis skills; and (c) open-ended response prompts concerning the intended significance and nature of ePortfolios projects in the courses, as well as perceived pros and cons of using the practice.

Intervening variables that occurred over the five-year period between surveys included requiring ePortfolio usage in both courses, training sessions on how to incorporate ePortfolios into the curriculum, and administration-approved stipends for two part-time faculty members to provide technical and instructional design support to program faculty. The ePortfolio platform was consistent through both data collection periods, but the platform did undergo a user-interface update in between data collection periods.

To provide proof that ePortfolios make student learning and experiences evident, I collected anonymized student writing samples from published ePortfolios from the CINQ101 and JRSM301 courses. By being enrolled in the university's undergraduate programs, the students represent a homogenous sample rather than a heterogeneous sample although their demographic characteristics and educational backgrounds may vary. All written samples were published in English to the Digication ePortfolio platform and followed the prompts provided by instructors of CINQ101 and JRSM301.

Survey data were analyzed using Excel and MAXQDA, a computer software program designed for computer-assisted qualitative and mixed methods data, text and multimedia analysis in academic, scientific, and business institutions. MAXQDA is developed and distributed by VERBI Software. Microsoft Excel is developed and distributed by Microsoft.

Results

Instructor Survey

Of the 33 adjunct and three full-time instructors in Academic Year (AY) 2018–2019 and 23 adjunct and two full-time instructors in AY 2022–23, 10 participants received both surveys. 17 responses were completed in AY 2018–19 and 15 were completed in AY 2022–23. In AY 2018–19, four respondents taught CINQ, seven taught JRSM, and seven taught both courses. In AY 2022–23, three respondents taught JRSM and 12 taught both courses.

Figure 1

Comparing Responses on the Use of ePortfolio in Engaging the Students in the Learning Process

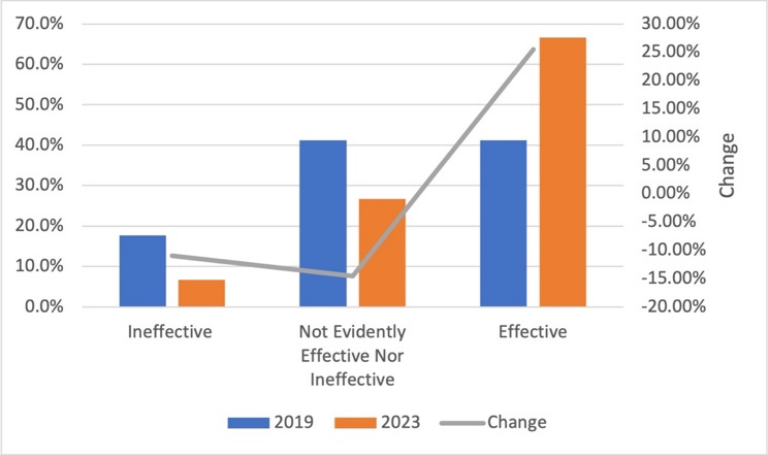
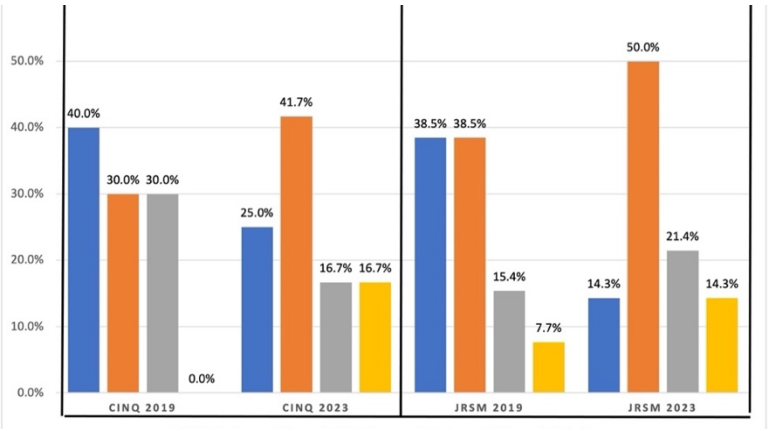


Figure 2

Comparing Responses on the Use of ePortfolios for Reflective Work



Likert-Scale Items

The Likert-scale section of the survey included some notable longitudinal findings. Since the samples were so small, descriptive findings are appropriate using percentage comparisons.

In 2023, more faculty found ePortfolios effective in engaging students in the learning process than in 2019. Figure 1 illustrates a decrease of 10.98% in the "ineffective" and 14.51% in the "not evidently effective nor ineffective" choices, while there was an increase of 25.49% in the "effective" option.

In 2023, more faculty found ePortfolios effective for reflection in CINQ (the first-year course) and JRSM (Junior course) than in 2019 as seen in Figure 2. In 2019, no respondents selected "extremely effective," but 40% selected "not effective" for CINQ in 2019. There was a 16.7% increase for the "extremely effective" option and a decrease of 15% for "not effective" for CINQ in 2023. As far as JRSM, there was an even greater decrease of 24.2% for the selection of "not effective" with a 12.6% increase combined for "effective" and "extremely effective." Overall, faculty found using ePortfolio for reflective work effective for both courses more than originally reported in AY 2018–19.

In 2023, more faculty found ePortfolios effective in enhancing student learning than in 2019. As shown in Figure 3, 35% of respondents in 2019 reported that ePortfolios were "not helpful" in enhancing student learning. By 2023, the selection of that response decreased 22% to 13.3%. The "helpful" and "extremely helpful" categories increased 17.3% in that same period. Faculty perceptions of ePortfolio efficacy improved significantly over the five-year period, with more faculty members reporting that they effectively engage students and enhance learning.

Figure 3
Comparing Responses on the Effectiveness of ePortfolios on Student Learning

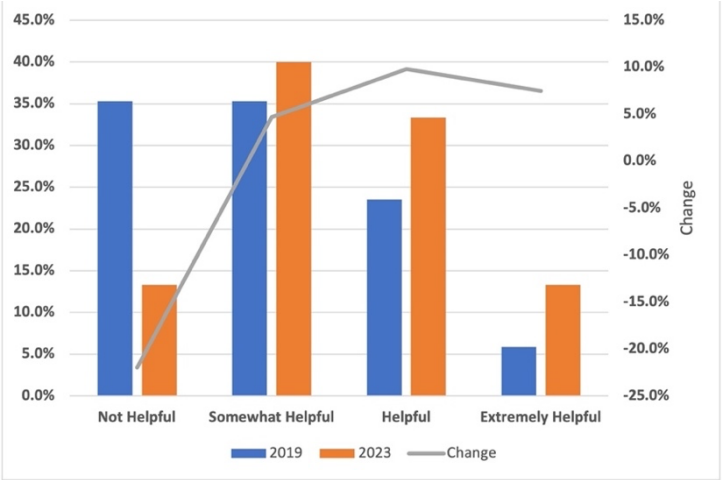


Figure 4
Comparing Responses on the Ease of Use of the ePortfolio Platform



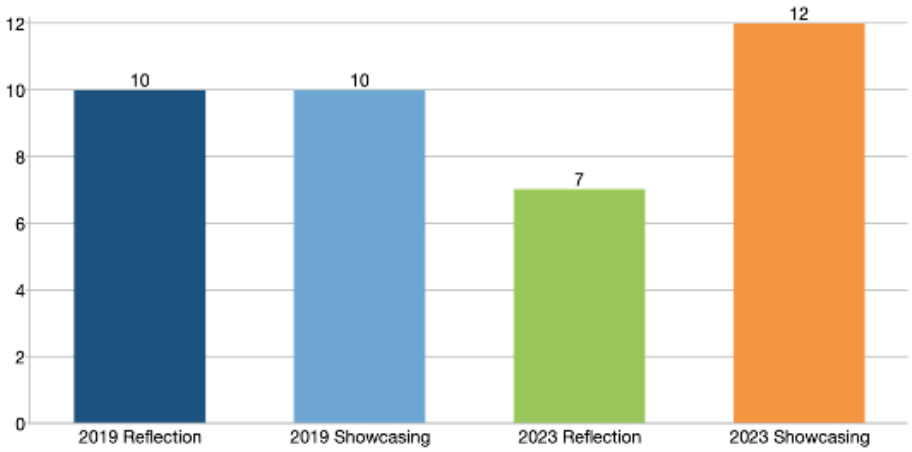
There was no considerable difference between 2019 and 2023 regarding the ease of use of the ePortfolio platform's technology. As seen in Figure 4, most responses in both time periods were in the "manageable, but somewhat difficult" (50%) and "not 'easy,' but certainly manageable" (30% for 2019 and 40% for 2023) categories. During this period, the platform did undergo a user-interface upgrade.

Open-Ended Responses

With regards to the open-ended questions, the responses were coded in MAXQDA by year but also combined to discover major themes that emerged throughout the entire period. Two major themes emerged within the responses to the open-ended response prompt concerning the intended purpose and nature of ePortfolio projects as seen in Figure 5. In AY 2018–19, 59% (n = 10) of faculty reported using ePortfolios to have students reflect on coursework and their experiences. 59% (n = 10) also reported using the technology to showcase student coursework. In AY 2022–23, 47% (n = 7) of faculty reported using it for reflections on coursework and experiences, while 80% (n = 12) used ePortfolio to showcase student coursework.

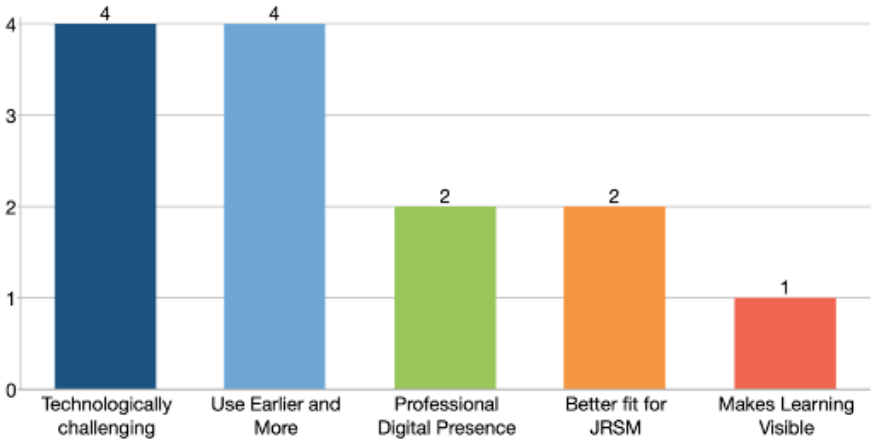
The additional open-ended response prompt regarding the perceived pros and cons of using the practice was also coded by year. As seen in Figure 6,

Figure 5
Categorized Responses on the Intended Purpose and Use of ePortfolios



Note. N of 17 for 18/29, N of 15 for 22/23

Figure 6
Categorized Responses on the Perceived Pros and Cons of Using ePortfolios for AY 2018–19



Note. N = 16

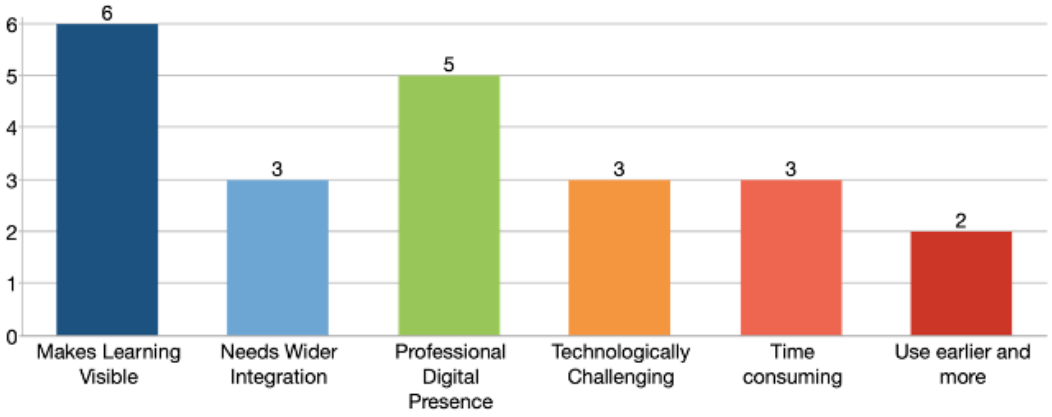
five categories surfaced from the 17 responses. 24% (n = 4) of faculty believe that the platform was technologically challenging and is also best used earlier in the course and more often. Overall, 12% (n = 2) of faculty recognize that ePortfolios help students build skills in developing a professional digital presence. Another 12% (n = 2) report that ePortfolios are a better fit for the upper-level JRSM301 course. One respondent (5%) mentioned how ePortfolios make learning more visible for students and instructors.

The same prompt was also coded by AY 2022–23. As seen in Figure 7, six categories surfaced from the 15 responses. In comparison to 5% from AY 2018–19, 40% (n = 6) of faculty described how ePortfolios make learning more visible for students and instructors. 20% (n = 3) of faculty believe that the platform was technologically challenging, reduced from 24% in AY 2018–19. 13% (n = 2) stated how ePortfolios are best used earlier in the course and more often, again down from 24% in AY 2018–19. 33% (n = 5) of faculty recognize that ePortfolios help students build skills in developing a professional digital presence, up from 12% in AY 2018–19. Two new themes that surfaced in AY 2022–23 (20% for both, n = 3) were criticisms of the platform's user-friendliness and a need for wider integration across the general education curriculum.

When the two years are combined, four major themes emerge throughout the entire period as seen in Figure 8. 44% of faculty report that the ePortfolio technology can be challenging. 37% believe that ePortfolios prepare students to have a professional digital presence. 37% also recommend using ePortfolios early in the semester and often. Another 37% of faculty believe ePortfolios make learning visible for students and instructors.

Figure 7

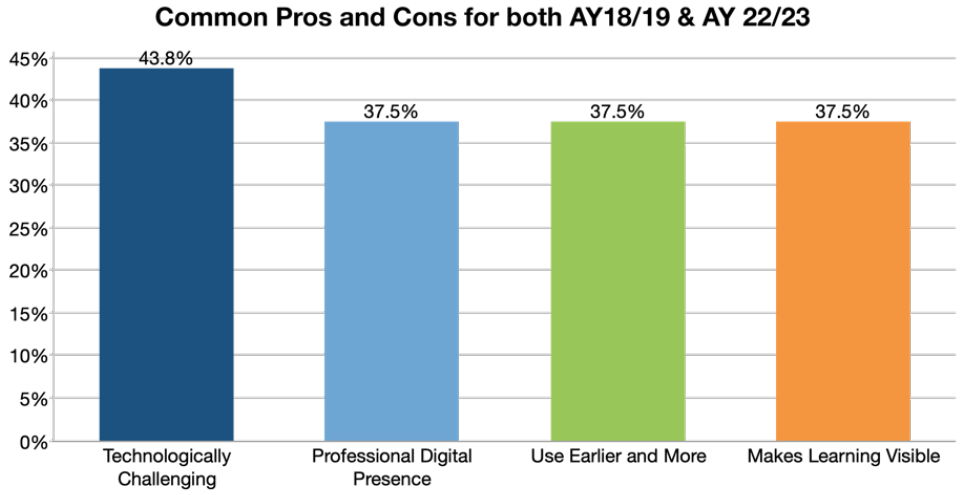
Categorized Responses on the Perceived Pros and Cons of Using ePortfolios for AY 2022–23



Note. N =15

Figure 8

Categorized Responses on the Perceived Pros and Cons of Using ePortfolios for Both Surveys



The two open-ended responses provided faculty with the opportunity to share their own narratives and reflections on using ePortfolios in their courses. Regarding student usage and engagement, Professor C stated, "In a world of evolving software, it is important to have basic skills in following directions and creating online content. The ePortfolios allow an introduction to these competencies for folks who may be intimidated by an online environment." Respondents also noticed how the students themselves see the impact of ePortfolio use. For example, Professor U affirmed how they "receive many positive comments in course evaluations and reflection pieces about how impactful the portfolio project is for students."

One respondent, Professor H described how ePortfolios are a flexible professional tool by stating, "I have an ePortfolio of my own. That was helpful because I could show the students what it looked like finished." The practice of professional digital identity was also touched upon when Professor V wrote, "I hope it encourages their sense of a wider audience than just me" while Professor T asserted, "I think the major benefit is knowing for sure that you can build and present a professional presence online with little difficulty."

Difficulty with technology and engaging student learning was expressed by a few respondents. Professor E believes that first-year students were "overwhelmed with use of new technology, and they showed little to no interest in learning. I think this is a better fit for JRSM. First semester freshmen spend more time coping than reflecting." Professor U describes the technological adoption issues with how:

> it took an entire class to get the students to understand the architecture design. . . . I felt that I needed roller skates in the computer room to help with all of the issues or questions. . . . I believe then the students would have been able to work on their ePortfolios with help. They get stuck at home or forget and then they get frustrated with the technology aspect.

To address the isolating aspects of teaching the platform design and interface, Professor S reflects on how it "would be easier to justify if the work of the portfolio were it being more heavily integrated across more general education courses. It would also share the burden of building the instructional curve for students." In the open-ended prompts, the faculty reinforced the notion that ePortfolios make student learning visible while highlighting technological challenges and the importance of broader curricular integration.

Longitudinal Findings

Five instructors completed both the AY 2018–19 and AY 2022–23 surveys. Overall, they all continued to implement ePortfolios during AY 2022–23 in the CINQ101 and JRSM301 courses and shared similar perceptions on the impact ePortfolios have on student learning, student engagement, and the reflection process in both responses. A noteworthy discovery is how faculty used the tool in similar ways, but two respondents explicitly reported the importance of integrating ePortfolios throughout the general education curriculum. Reasons given include to help lessen technological hurdles, as well as to promote student learning and reflection. Finally, one respondent related, "In a world of evolving software, it is important to have basic skills in following directions and creating online content. The ePortfolios allow an introduction to these competencies for folks who may be intimidated by an online environment." This echoes the research and literature that indicate the importance of implementing ePortfolio into general education curricula.

Student Writing Samples From Published ePortfolios

The purpose of this program evaluation and article is to determine if and how ePortfolios make student learning and experiences evident in general education. To determine whether there is evidence of student learning, narrative student writing samples from the ePortfolios need to be evaluated. Qualitative research empowers participants, such as students, by utilizing narratives to share findings effectively (Johnston et al., 2023). Narratives present information engagingly while making experiences evident. This program evaluation includes a collection of narratives from student ePortfolios from the first-year and capstone general education courses.

Student narratives from the first-year course included reflections on the process and purpose of creating an ePortfolio. Student A from CINQ101 wrote:

> The process of creating this e-portfolio was educational since I have never made an e-portfolio before. It was a new experience, but it was enjoyable being able to personalize the portfolio to my liking. By creating this portfolio it helped me organize the assignments I have completed throughout the semester. (Student A)

Another student reflected on the ePortfolio, writing:

> [It] taught me how important it is to revise all of my information before it is uploaded. It also was a great reflection for me towards the end of the year. It allowed me to expand my knowledge on topics I have previously written about in school. (Student B)

Other students reflected on how they engaged with specific topics and the expression of learning. Student C revealed that the ePortfolio allowed them "to express my thoughts and opinions on something that is meaningful to me which is the importance of mental health, a topic that I once was ashamed to talk about." Another student wrote:

> Completing this e-portfolio was a very enjoyable time. . . . I really like that this gives me the chance to show future employers work that I have done, as well as lets me look back at what I did this year in Critical Inquiry. (Student D)

By integrating personal reflection, skill development, and career preparation, ePortfolios used in first-year courses serve not only academic functions but also deepen students' connection to their learning journeys. This learner-centered approach empowers students to take ownership of their education and express their growth in meaningful ways.

At the JRSM301 Capstone level, the writing samples illustrate the academic and personal advancement of upperclassmen. Student E from the capstone course described how before taking the course they believed "I needed to sound a particular way in my writing, that I needed to sound like an intellectual academic. What I came to discover is that my thoughts flow so much more easily when I am being my authentic self." Another JRSM301 student described:

> When reflecting on the process of completing this e-portfolio, I realized how much I was able to learn about my academic abilities. I feel more confident in my

> critical thinking, information literacy, oral communication, and written communication skills. I also was able to improve my time management skills as this process of completing the many parts to this project took quite some time. I divided my time into creating my PowerPoint presentation, writing my script for my final video presentation, and rehearsing what I was going to say. I also had to decide how I wanted to structure the e-portfolio and the colors I wanted to choose to make it very cohesive. Overall, I was able to solidify my expertise in all of the competencies that you will learn about through my portfolio. (Student F)

Not only can the students reflect on the process of using ePortfolios, but they have the opportunity to partake in meta-cognitive reflections on their undergraduate experiences in the course and their full curriculum. As far as deeper meta-cognition that connects directly to course-level outcomes, Student G explained how:

> As I have completed this portfolio, I have been pleased to see my improvement in certain areas. As I was going through semesters, I never had the time or space to identify growth in areas of my academic career. Although looking at the differences now, I can confidently say that I have improved in many skills. My critical thinking skills improving surprised me because I assumed they were always pretty good. Although I have tremendously improved my skills with information literacy since coming to Mercy, I still have areas to improve. With oral communication, I was fortunate enough to take an oral communication college course while I was still in high school, which improved my skills before coming to Mercy. Although I have good oral communication skills, I still need to improve my outlines for presentations and speeches. My quantitative reasoning skills will continue to improve as I learn how to manage my money in the future. Reading fluency is a skill I have had since I was very young, and I'm optimistic that as I continue with higher education, it will continue to improve. Although I have improved my written communication skills, I know that I will need to continue working on specific aspects of writing in the future. I was delighted with the outcome of this portfolio, which shows that my education has positively impacted me.

The samples effectively capture the transformative nature of using ePortfolios in the capstone experience, where students not only enhance their academic competencies but also engage in personal growth. By fostering a sense of authenticity and equipping students with practical skills, the course and ePortfolios prepare them for future challenges both within and beyond academia.

Discussion and Recommendations

The program evaluation results can be viewed through the lens of the Catalyst Framework, which explores how ePortfolios can deepen student learning, improve student success, and catalyze learning-centered institutional change (Eynon & Gambino, 2017). The goal of the study was to discover how the respondents perceived ePortfolios' ability to enable and assess intellectual growth by helping students make meaning of their learning experiences through reflection. Based on the survey data collected, faculty perceptions and usage of ePortfolios improved over the five-year period.

Some external factors that may have influenced the changes in perceptions over the five-year period were the program-wide requirement to implement ePortfolios, training of instructors on training for instructors on the technical and pedagogical use of the platform, support from the University's Center for Teaching and Learning, and familiarity with the platform for faculty and students.

Student Learning and Success

Over half of the faculty reported using ePortfolios to enable students to showcase coursework and share experiences. In 2023, more faculty reported that ePortfolios effectively engage students in the learning process and enhance student learning than in 2019. More participants also found ePortfolios effective for reflection in CINQ101 (the first-year course) and JRSM301 (the capstone course) than in 2019. This suggests that sustained exposure, mandatory implementation, and ongoing training can overcome initial instructor skepticism. This growing faculty buy-in is a critical foundation for any institution-wide educational innovation, as it creates a cohort of advocates who can mentor reluctant colleagues. Overall, faculty attitudes about the purpose and efficacy of integrating ePortfolios into these courses improved over the five-year period. A recommendation would be for the university to capitalize on this positive shift by creating a formal community of practice where these experienced faculty can share best practices and mentor faculty, further solidifying support and promoting consistent pedagogical approaches.

In contrast, faculty's experience with ePortfolios ease of use did not show significant improvement over the five-year period; 44% of participants explicitly reported technology hurdles with ePortfolios in the open-ended questions. Of those faculty, a majority expressed that students encounter technical issues with the platform, and almost half stated that students require hands-on assistance from faculty during initial use. This trend indicates that the current adoption and support structures are insufficient. If left unaddressed,

these technical barriers can undermine the pedagogical benefits of ePortfolios, increase frustration for both students and faculty, and threaten the program's sustainability. Faculty are having to act as tech support, which detracts from their primary role as instructors. Future data collection and research that focuses on overcoming technological hurdles through an intervention, a new platform, or new procedures can address this issue. One such intervention can include embedding mandatory, credit-bearing ePortfolio tutorials into the curriculum, staffed by IT assistants or peer support, and by creating a suite of easily accessible video guides for students.

The open-ended questions also revealed that faculty believe ePortfolios prepare students for the future by developing a professional digital presence, and they are a better fit in upper-level courses than introductory-level courses. The latter could be a result of upper-level students demonstrating more advanced reflection and technical skills. This perception creates a strategic risk. If ePortfolios are introduced only in the junior year, students miss the opportunity for longitudinal growth and reflection across their entire academic journey. The struggle in first-year courses is likely not due to an inherent misfit but to a lack of adequate scaffolding and support. Rather than delaying ePortfolio use, the GE program should enhance scaffolding in first-year courses. This includes simplifying initial tasks, such as "upload one paper and write a two-sentence reflection" or integrating low-stakes tech practice early in the semester, while explicitly framing the CINQ101 ePortfolio as the foundation for a project that will culminate in JRSM301. Future research would benefit from focusing on the impact of integrating ePortfolios early in the first year rather than waiting until students are in upper-level courses.

Overall, the writing samples from both first-year and upper-class students demonstrate that ePortfolios facilitate a learner-centered approach that enhances academic engagement, personal growth, and preparation for future endeavors. The students describe the purpose and impact of ePortfolios, how ePortfolios and narratives are a tool for engagement, how they have transformed through the curriculum, and how ePortfolios allow them to be their authentic selves. This analysis reinforces the potential of ePortfolios as transformative educational tools in higher education.

Learner-Centered Institutional Change

Other recommendations from faculty include starting ePortfolio integration early in the semester and embedding ePortfolios throughout a wider curriculum, such as general education. Isolated ePortfolio use in one or two courses places a disproportionate burden on those instructors. This frames the ePortfolio as a separate "add-on" rather than an integral part of the learning experience. Wider integration normalizes the technology, distributes the responsibility for teaching its use, and allows students to see connections between all their courses, which is the goal of integrative learning. The entire structure of Mercy University's general education curriculum is undergoing a redesign, and the encouraging evidence from various courses on student engagement and success with ePortfolios serves to support an expansion of its use throughout the curriculum. These program evaluation findings support the redesign structure that has been proposed. The updated general education curriculum makes embedding the use of ePortfolio a priority. First off, the foundation of the curriculum is grounded in three Integrated Seminars. These scaffolded seminars will be where the general education mission's commitment to a collaborative classroom environment centered on applying their knowledge is made most relevant and dynamic to students. To ensure success, this rollout must be accompanied by the recommended robust technical support and cross-disciplinary faculty development to ensure consistency and shared expectations.

A First-Year Seminar course will assist students with transitioning to college, developing a sense of belonging at Mercy, and helping students leverage the general education curriculum. The second seminar will focus on a transformative idea that has made a profound impact on our shared lives, which intends to highlight the relevance of the liberal arts as a way of understanding the world, while teaching students communication, technology, critical thinking, and teamwork skills. This Transformative Ideas Seminar will lead students to the third seminar, Big Problems, in which students will apply their liberal arts education to a real-world problem. This course affirms Mercy's institutional commitment to global citizenship and invites each student to build on the First-Year Seminar by further developing their sense of personal and professional mission. Each seminar will have signature assignments for students to upload into an ePortfolio, allowing students to reflect upon their progress as learners, encouraging them to connect their learning, and providing a foundation for a dossier (which can be augmented from work in their respective majors or elsewhere in the curriculum) that will help them as they enter the job market. While these seminars will be designed to help students understand the relevance of the liberal arts to a range of professional and academic trajectories, none will be exclusive to one program or discipline.

Study recommendations are for the university to leverage this dynamic platform in the new general education curriculum to make the diverse stories of undergraduate learning more visible to students, faculty, and administrators. For reflective and learner-centered ePortfolio implementation to be successful across the curriculum, technical and pedagogical support for faculty and students is critical. This revision

to the general education curriculum could improve on the existing processes and support student learning.

Conclusion

The implications of this study extend far beyond a single institution, offering valuable insights for the broader higher education community engaged in implementing HIPs. The findings demonstrate that the successful integration of ePortfolios is less about the specific technology chosen and more about a sustained, institution-wide commitment to pedagogical and technical support. The observed improvement in faculty buy-in over the five-year period underscores that initial resistance can be transformed into advocacy through mandatory implementation, ongoing training, and evidence of student success. However, the persistent challenge of technological barriers serves as a critical caution: without dedicated, easily accessible support structures and platforms that relieve faculty from serving as first-line tech support, even the most powerful pedagogical tools can be undermined. Ultimately, this study reinforces that ePortfolios are a potent mechanism for making learning visible, but their success is contingent on a strategic, supported, and scaffolded approach that integrates them into the curriculum not as an isolated project, but as a foundational element of the student's entire educational journey.

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Appendix A
Survey Instruments From AY 2018–19 and 2022–23

Seminar Faculty ePortfolio Reflection Form (AY 2018–19)

You have been identified as having taught either (or both) Critical Inquiry and Junior Seminar at Mercy College in the following semesters: Fall 2018 or Spring 2019. We are collecting information regarding the usage of ePortfolios within the Seminar Program.

Seminar Faculty ePortfolio Reflection Form (AY 2022–23)

You have been identified as having taught either (or both) Critical Inquiry and Junior Seminar in the following semesters: Fall 2022 or Spring 2023. We are collecting longitudinal information regarding the usage of ePortfolios within the Seminar Program. This form was also sent out in AY 2018–19, so the results will be compared to previous findings.

1. Name

2. Classes. In which classes have you used ePortfolio in your courses?
   - Critical Inquiry
   - Junior Seminar
   - Both
   - Other

3. If this is not your first semester using ePortfolio, what is the total number of your sections per Academic Year that have used it to date?

Intended Purpose

4. For what purpose did students create these folios (e.g., student showcasing and/or reflection of personal and academic progress, strengths and challenges)? To show knowledge of competencies?

Student Learning

5. How helpful do you think the use of ePortfolio was in enhancing student learning and achievement of course competencies?
   - Extremely Helpful
   - Helpful
   - Somewhat Helpful
   - Not Helpful

Reflection

6. For CINQ Faculty only. How effectively did e-portfolio help your students to reflect on their ability to read critically, think critically, and practice information literacy?
   - Extremely Effective
   - Effective
   - Somewhat Effective
   - Not Effective

7. For JRSM Faculty only. How effectively did e-portfolio help you to reflect on your ability to read and think critically, write and speak effectively, and exercise information literacy and quantitative analysis skills?
   - Extremely Effective
   - Effective
   - Somewhat Effective
   - Not Effective

Student Engagement

8. How effective do you think the use of ePortfolio was in engaging the students in the learning process?
    - Extremely Effective
    - Effective
    - Not Evidently Effective nor Ineffective
    - Ineffective

Ease of Use

9. Overall, how manageable or difficult was the use of technology?
    - Easy
    - Not "Easy," but Certainly Manageable
    - Manageable, but Somewhat Difficult
    - Extremely Difficult

10. Feel free to elaborate on the nature of the ePortfolio projects in your Seminar classes, and your perceived pros and cons of using it (both in class and in the future).

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Building Reflective Practices: ePortfolios as Tools for Sustained Professional Development in Online Literacy Instruction

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The article analyzes seven ePortfolios in a certification program to examine ways in which portfolios benefit faculty and staff professional development. The Global Society of Online Literacy Educators (GSOLE) is one organization offering online literacy instruction certification; the organization was founded to give instructors opportunities to engage in theory-to-practice conversations about the design of online reading and writing courses. The analysis reveals themes of intentional online pedagogical design, inclusive practices, application of online writing instruction theory, and integration of teaching technologies into the online classroom. Findings highlight the importance of structured, reflective professional development programs that foster community and support continuous growth over time with ePortfolios being an effective fit for sustaining development. Systematic forms of process-focused professional development can support reflective practices and integrative portfolio thinking, and such models serve as a contrast to self-paced professional development approaches.

Despite decades of ePortfolio research validating benefits on student learning, growth, and academic development, ePortfolios and their use in faculty and staff professional development contexts is still being explored. Literature in this area focuses on tenure and evaluation repository-style portfolios (Hoekstra & Crocker, 2015; McColgan & Blackwood, 2009; Seldin et al., 2010), class instructional portfolios (Bhika et al., 2013), and the use of ePortfolios with student-teachers (Granberg, 2010) more so than how ePortfolios might inform professional development for full-time instructors and staff. Likewise, educational development has not fully explored roles ePortfolios might play in sustained professional development, with many centers for teaching and learning continuing to favor quick and efficient one-off opportunities, such as webinars, workshops, and self-paced, completion-focused online modules that accommodate limitations in faculty and staff availability, labor, and time (Marquita et al., 2015). Sustained professional development opportunities, however, can allow faculty and staff to apply their learning to local policies and exigences and reflect across time, which can be especially important for faculty teaching heavy loads. ePortfolios can support this sustained work, particularly for online educators. Identifying avenues for development opportunities among online educators is especially consequential because they are more likely to hold contingent and part-time positions, and such practitioners are less likely to have access to on-campus professional development funding and support (Anderson, 2007; Baik et al., 2018). The online literacy certification program discussed in this article offers an illustrative example of such sustained professional development programming with ePortfolios serving an important role in participant learning and growth.

As readers of the *International Journal of ePortfolio* know, ePortfolios have the potential to offer reflective and process-oriented learning experiences conducive to meaningful professional development because they foster identity formation, the integration and application of knowledge, and sustained growth over time (Seldin et al., 2010). Such benefits for students have potential for faculty and staff as well (Caldwell et al., 2017). Further, ePortfolios can bridge professional development with practice, linking teaching theories with local application through the creation of artifacts. However, more research is needed to understand whether and how ePortfolios might enhance development practices for faculty and staff outside the tenure and evaluation process.

This article presents a case study of ePortfolios created by seven participants in the Global Society of Online Literacy Educators' (GSOLE) eight-month, asynchronous professional certification program for online literacy instruction (OLI). By studying these ePortfolios, we hoped to gain a deeper understanding of participant experiences in the certification program. Through descriptive data analysis in this article, we highlight ways in which ePortfolios can align with sustained, integrative, locally applicable, and reflective professional development for online literacy instructor (OLI) participants. We begin by exploring existing connections between online professional development and ePortfolios in the literature. Following a brief methods section, we highlight how faculty and staff ePortfolios in the certification program illustrated strengths related to participants' emerging OLI conceptual knowledge and their ability to reflect on applying that theoretical knowledge in local contexts. We also recognize the limited appearance of identity

formation in these ePortfolios, which is an impactful finding given the emphasis on identity formation in literature discussing student ePortfolio practices. We conclude with implications for educational developers and writing program administrators interested in developing professional development with ePortfolios.

Literature Review

Before sharing our findings, we situate this project within the contexts of online literacy instructor preparation and professional development and ePortfolio scholarship. For students, scholarship has shown ePortfolios can serve as dynamic digital spaces for showcasing learning artifacts and connecting academic experiences to career goals through reflection. For faculty and staff, however, the value of ePortfolios as professional development tools remains uneven, often limited to repository-style formats used for tenure and promotion.

Online Literacy Instruction

GSOLE's decision to build its professional development around a capstone ePortfolio responds to gaps left in the professional development opportunities online writing faculty can usually access. These are often local instructional technology workshops that focus on the mechanics of specific applications, or for-profit certification courses that teach faculty how to present their course material online. While these experiences can offer faculty some new strategies, they often focus too broadly on online instruction rather than engaging with the specific literacy demands of online writing instruction; thus, participants may have to retrofit what they learn to meet the needs of their curricula. Hewett and Ehmann (2004) and Rice (2015) proposed frameworks that literacy programs and individual literacy instructors can adopt to prepare for online teaching. Similarly, Bartolotta et al. (2023), Bourelle et al. (2015), Egger (2023), and Melonçon (2017) described specific OLI-focused professional development designs—sometimes grounded in specific theoretical frameworks—that support local, and often vulnerable, faculty, like contingent instructors and graduate students. Because these models were designed either as workshops, a workshop series, or a graduate seminar, they either did not require participants to create final deliverables or participants were required to produce a term project. But ePortfolios were never this final deliverable. GSOLE believed that graduate courses like those described by Bourelle at al. (2015) and Egger (2023) provided good models for learning theories of OLI but chose ePortfolios as the final deliverable to demonstrate participants' overall learning.

Within the context of OLI, specifically, student ePortfolios can respond to common challenges associated with asynchronous online learning, such as maintaining engagement, providing timely feedback, and ensuring equitable access to technology by fostering student autonomy, enabling diverse modes of expression, and facilitating ongoing reflection and assessment (CCCC Committee for Best Practices in Online Writing Instruction, 2013; GSOLE, 2019). For instance, ePortfolios can showcase a range of multimodal artifacts, such as written texts, videos, and interactive projects, demonstrating competencies across different communication forms. Scholars in online writing instruction and online teaching and learning have long advocated for greater understanding of how to enhance effective online teaching practices to increase student retention (Harris & McCloud, 2015), learning (Litterio, 2018), and success in online courses (Borgman & Dockter, 2018; Greer & Harris, 2018).

ePortfolios

Key studies on ePortfolio construction, presentation, and assessment underscore the value of ePortfolios, especially how they facilitate reflective processes and leverage digital affordances to link conceptual knowledge to application and practice (Paulson & Paulson, 1991; Wills & Rice, 2013; Yancey, 1999). Although the benefits of ePortfolios for students and graduate-level student-professional preparation are well documented, their implementation among faculty and staff remains predominantly limited to repository-style portfolios used for promotion and tenure, formats that often lack emphasis on reflection and integrative learning.

The existing ePortfolio scholarship identified three types of ePortfolios—learning, showcase, and assessment (Caldwell et al., 2017). Learning ePortfolios help students "reflect on and connect learning across academic and co-curricular learning experiences," and often feature artifacts that illustrate learning processes (Eynon et al., 2014, p. 98). Showcase ePortfolios, meanwhile, can help students bridge their academic experiences with the development of employable skills, helping them construct their digital professional identities (Cordie et al., 2019). Finally, assessment portfolios are used to evaluate how well student learning artifacts show the completion of programmatic or institutional learning outcomes. Across these types, Eynon et al.'s (2014) study of 24 institutions participating in the Connect to Learn (C2L) network found that ePortfolio artifacts not only made learning more visible but also catalyzed deeper, more intentional reflection. Such reflection enabled students to connect disparate learning experiences, identify strengths and areas for growth, and relate academic work to co-curricular engagement and professional standards. Research supporting the efficacy of ePortfolios to

support reflective and meaningful learning has caused the AAC&U to name ePortfolios a high-impact practice (Watson et al., 2016).

ePortfolios, particularly professional or showcase ePortfolios, serve as valuable tools for demonstrating practical skills and professional readiness, aligning academic work with industry expectations (Cordie et al., 2019). Because professional ePortfolios provide a space for showcasing connections between academic experiences and career goals and skills, Cordie et al. (2019) linked them to the demonstration of career readiness. One of their conclusions of graduate student ePortfolio use in three different programs was that "best practice ePortfolio work requires support across time as authentic learning requires intense revision and reflection" (p. 24). Especially in professional contexts like certification courses, providing time to prepare and deeply engage with course material is necessary for developing the kinds of reflection and engagement needed to communicate a public-facing professional identity. The use of ePortfolios in graduate programs, particularly within education and healthcare contexts, has likewise emphasized that ePortfolios can support professional training, aligning licensure or certification standards with reflective practice, competency documentation, and identity development (Kirby et al., 2023; McLean & Bullard, 2000).

In contrast to the large body of scholarship documenting how students benefit from ePortfolio development, less explored is how full-time instructors and staff can benefit from ePortfolios. In the literature, experiences are often linked to what faculty can learn from assessing student ePortfolios rather than benefits of these individuals developing portfolios themselves (Bhika et al., 2013; Carpenter et al., 2018; Karkowski et al., 2023; Marshall et al., 2017; Torre, 2019). Takayoshi and Selfe (2007), for example, noted that reviewing student ePortfolios benefits instructors as ePortfolio assessment can help educators think critically about their work and its presentation. Belanoff and Dickson (1991) linked portfolio assessment to community and collaboration, noting that assessment settings can offer a kind of professional training for faculty and staff and combating teacher isolation. Because ePortfolios have the potential of making "learning visible" and "support[ing] reflection, social pedagogy, and deep learning" (Eynon et al., 2014, p. 95), we believe just as they support student learning, they can support also instructors and staff completing professional development programs, helping them connect learning and professional applications.

ePortfolios as Professional Development

When it comes to full-time instructors and staff creating ePortfolios themselves, scholarship is mixed. Often, the use of faculty-created ePortfolios takes up tenure portfolios, which appear much more like digital repositories than the reflective, integrative examples we see described in ePortfolio literature (Lakin, 2016; LeVan, 2020; Pinto Zipp, 2010). While electronic in nature, these portfolios are meant to replace "three-ring binders" and make credentials of faculty more electronically accessible and visible (Ajobon et al., 2022). Faculty making these portfolios may struggle to understand their value and purpose outside of a limited evaluation and promotion context, making the technological barriers to ePortfolio creation more insurmountable (Wai-tsz Fong et al., 2014). ePortfolios grounded in reflection and integrative learning and paired with sustained professional development programs can have great impact on instructors and staff.

There are some examples in the literature of faculty creating these more intentional and reflective ePortfolios. When extending what we know about professional student ePortfolios to educators, ePortfolios enable the showcasing and development of teaching philosophies, research, and service activities with documentable process-based evidence as teaching products, demonstrating professional growth and reflective practice. For example, the National Forum of Teaching and Learning in Higher Education in Ireland found that ePortfolios offered faculty and staff a flexible and individualized approach to developing academic practice and gathering evidence to be used later in promotion and evaluation processes, although time was a considerable barrier (Costelloe, 2021). Danowitz (2012) also highlighted the potential of these ePortfolios to support reflection and professional showcasing while demythologizing tenure requirements and creating avenues for peer-to-peer mentoring. The approach allows faculty to integrate feedback, reflect on their teaching practices, and document achievement. ePortfolios can also serve as tools for peer review and collaboration, providing a platform for faculty to share best practices and engage in professional dialogues, supporting the growing emphasis on lifelong learning and the need for educators to adapt to evolving educational technologies and pedagogies.

Challenges to Supporting Instructor and Staff ePortfolios

A caveat to the creation of these ePortfolios is the labor and time involved for ePortfolio creators (Costelloe, 2021). In the context of enhancing online teaching, which is the focus of GSOLE's certification, those doing the work are often graduate students, non-tenure-track instructors, and contingent faculty (Bedford, 2009; Mechenbier, 2015; Mechenbier & Warnock, 2019; Melonçon, 2017)—those who may lack the support and time to both complete a

certification and an ePortfolio that is not immediately valued in typical professional academic systems. This population of instructors is even more likely to be institutionally under supported, unstable, and even further removed from the financial and social support afforded to full-time faculty (Executive Committee, 2020). For this reason, on initial inspection, the creation of an ePortfolio in a professional development program catering to online faculty and staff might seem like an impossible task. However, aligning with some ePortfolio best practices like scaffolding, structuring time for reflection, and connecting learning with career goals can make the process of creating the ePortfolios more meaningful and less cumbersome (Cordie et al., 2019; Eynon et al., 2014).

Guiding faculty and staff through the process of ePortfolio development is not easy. In the GSOLE OLI certification program, we leverage hands-on training workshops, reflective practice, and the integration of technology and assessment. Mentorship and peer review help educators refine their portfolio thinking, gain diverse perspectives, and improve inclusive and reflective practices. Ongoing support and resources include instructional guides and model portfolios. After ePortfolio creators have had an opportunity to construct their ePortfolio and refine it with peer and mentor feedback, ePortfolios are formally assessed by trained evaluators who are also experts in OLI. Faculty development certification programs, like the certification discussed in this article, can build on the history of composition pedagogical frameworks and portfolio theory to validate the skills and competencies of educators making ePortfolios and promote a culture of reflective practice and continuous improvement.

Methods

Research Context

The Global Society of Online Literacy Educators (GSOLE) is a professional organization that connects online reading and writing instructors and tutors through its annual virtual conference, webinars, open access publications, research support, and certification program. We are GSOLE members and leaders in both the certification program and organization. Started in 2020 by a subcommittee of online literacy instruction (OLI) designers, the certification program was designed to move beyond isolated, self-paced, one-and-done online teaching certification programs (GSOLE, 2019), favoring instead a sustainable approach to give participants opportunities to reflect on current scholarship and how it speaks to participant identities—goals which align strongly to values found in ePortfolio theory and practice. The Basic OLI Certification spans eight months to foster participant interaction with instructor-mentors who are experts in the field of OLI and to develop an ePortfolio in which they reflect on their OLI identity, integrate what they have learned into local contexts through the creation of seven artifacts, and consider how they will connect GSOLE's principles and tenets (2019) to teaching practices that emanate from their values about writing and online education (Cicchino et al., 2021).

As participants complete their artifacts, they reflect on their creation and are given feedback by their instructor-mentor. Participants are given an assignment sheet with background information on ePortfolios, links ePortfolio design templates, and detailed instructions for completing the ePortfolio (see Appendix). The assignment sheet and ongoing feedback foregrounds the importance of theory, encouraging participants to "communicate your growing expertise in OLI" by "linking your practice to OLI scholarship and research" (Appendix). Along with ongoing reflection and feedback during the certification, the final module focuses extensively on the ePortfolio's creation. Participants have the option of creating learning or professional ePortfolios and choose artifacts that align with their broader personal and professional goals. While each ePortfolio type is described in greater detail in Appendix, learning ePortfolios are more personal and ask participants to "reflect on new knowledge and how the learner will apply that knowledge to their local context" (Appendix). These portfolios focus more on participant growth and understanding connected to their local contexts whereas the professional ePortfolios are meant to be public-facing and showcase a professional online identity. For example, participants have used the professional ePortfolios on the job market or for promotion or contract review.

After participants complete the ePortfolio, it is evaluated on a pass/fail basis by a Board of ePortfolio Evaluators who assess shell functionality, the Theory of OLI, artifacts, reflective writing, and overall demonstrated expertise in OLI. Participants who do not pass the portfolio have the option to revise and resubmit their ePortfolio for re-evaluation. All portfolios in this study earned a "passing" evaluation on either an initial or revised submission.

This ePortfolio analysis is part of a larger qualitative study tracing the effects of the Basic OLI Certification program among participants, including pre-/post-surveys, interviews, and document analysis. As one source of data in that study, the team analyzed seven ePortfolios created as the final assessment benchmark for completing the GSOLE Basic OLI Certification. Existing research on faculty/staff ePortfolios is limited as time constraints and recognition systems rarely provide faculty/staff with adequate support and incentive to develop ePortfolios. The certification program is unique in

requiring an ePortfolio as the final step in certification. While limited in number (n = 7), we hope this analysis can offer examples and raise important questions about learning and professional ePortfolios when developed as part of a professional development certification program.

Participant Demographics

While all certification participants were invited to join the study, only nine consented to participate in some form of data collection (survey, interview, and/or ePortfolio analysis). Seven of those participants gave us permission to analyze ePortfolios. Participants worked primarily at four-year (n = 5) and two-year (n = 2) colleges. Many have also matriculated into GSOLE leadership positions. They held a range of professional appointments, including two staff and three non-tenure-track, one pre-tenure, and one tenured faculty within a K-12 college bridge program. Four had previous experience teaching online when they began the certification program while three had not taught online when they registered for the certification program. Five created professional or teaching ePortfolios while two created learning ePortfolios.

Data Analysis Process

Goals of this research study were descriptive rather than experimental in nature; consequently, data analysis methods emphasized describing patterns and characteristics in these data as opposed to developing replicable research results or certification models. In this article we focus on three research questions connected to participant ePortfolios:

1. After completing the program, how did participants communicate their OLI identity and knowledge in either a learning or professional ePortfolio?
2. How did ePortfolios illustrate participant growth in the Basic OLI Certification Program?
3. What did participants come to value in OLI and in what ways (if any) were those values present in their ePortfolio?

The research team analyzed data in ways informed by inductive methodological approaches of grounded theory (Glaser & Strauss, 1999), such as recursive questioning and discussion, axial coding, thick descriptions, and saturation. In addition, deductive approaches informed by our knowledge of the certification program and the GSOLE organization were also utilized. Members began by grouping excerpts from the full set of data collected for the study (ePortfolios, interviews, and surveys) into patterns and themes through open, inductive coding.

Next, the team engaged in conversations about our research questions, the certification curriculum, and the GSOLE Principles and Tenets (2019) driving that curriculum, as we reviewed the early themes and continued reading more excerpts. The five-person research team agreed on t-unit length (one unit of thought) and during early rounds of coding, limited analysis to no more than double-coding each t-unit to help us define the boundaries of each code. Geisler and Swarts (2019) highlighted the importance of determining rules and structure, particularly across a research team, as "two people may segment the same string of language in two different ways," leading to inconsistencies in analysis and potential issues when attempting to apply codes to these data (p. 67). The team gathered iteratively from January to December 2023 to discuss potential codes, practice applying these codes, and refine the codebook by eliminating or adding codes. Each meeting, the group would arrive with sets of individual codes assigned to a sample of data, their individual coding sets would be merged, and they would discuss the points of disagreement using the constant comparative method (Glaser & Strauss, 1999). Constant comparative method emphasizes the importance for ongoing reflection and analysis throughout the coding process—even if that process causes some confusion as coding concepts emerge and are refined (Heath & Cowley, 2004). As coding progressed and the research team came to better agreement about the definitions and applications of each code, coding was opened to allow for more than two code co-occurrences per t-unit when necessary.

Codes were applied using ATLAS.ti, a coding software that allows for individual, merged, and collaborative coding and includes the ability to upload and code images. ePortfolios were uploaded as a string of connected PDFs. While we acknowledge that presenting ePortfolios in PDF format minimizes the digital capacities of the portfolio, ATLAS.ti required a stable representation of the ePortfolio to store assigned codes. For this reason, the codes were assigned primarily to the written text (including transcripts of videos) and static images in the portfolios. During our coding process, ATLAS.ti released an AI-enhanced coding feature, which we opted not to use. After a year (spanning 10 meetings), the research team finalized 10 codes for the full research project—nine of which appeared in ePortfolio data. We provide the nine active codes and their definitions in Table 1. We offer a summary of these codes and their data in the reporting section below before aligning patterns in coding to implications for faculty/staff portfolios and portfolio-related professional development programs.

Table 1
Codes and Code Definitions

Code	Code definition
Self-awareness or intentionality	Purposeful attention to class, pedagogical design, or the choices they make as online teachers (e.g., choosing particular technologies, assignments, policies). Includes choices that in reflection they would make differently or not do again.
Inclusion, diversity, equity, accessibility (IDEA)	An approach to OLI that values accessibility-driven inclusive practices, like welcoming all students, an awareness of limited access to internet and technology, IDEA pedagogical strategies, choice of using certain technologies because of access, and/or an awareness of technical accessibility practices.
Affect	Feelings associated with professional development, GSOLE, or teaching online
Teaching identity/schema – certification	The values, principles, outlook, and expectations that participants held before, during, and after the certification; may be described with "I am . . ." or "I believe . . ." statements.
Community of professional development support	The recognition of a social professional network through an acknowledgement of the professional OLI community, institutional community, teaching/learning community, etc.
Theory	Participants allude to readings, research, and concepts found in OLI scholarship (going beyond "tips and tricks" or OLI lore).
Praxis and application	Application-driven practice of theoretical concepts related to OLI research or scholarship. Practice must identify specific/concrete examples, activity, strategy from a teaching environment.
Technology	Identifying affordances or technologically grounded knowledge by mentioning specific technology tool by name or technology phrase nonspecific to tool (e.g., voice to text, LMS)
Motivation – certification	Situated in an awareness of why they took the certification program or in what ways the certification is important in their professional development, such as professional wellbeing, professional gain, community contribution.

Table 2
Frequency of Code Usage Within and Across Portfolio Types

Code	No. of quotations tagged (n = 7 portfolios, n = 678 total coded units of thought)	Freq. across professional portfolios (n = 5 portfolios, n = 580 total coded units of thought)	Freq. across learning portfolios (n = 2 portfolios, n = 98 total coded units of thought)
Self-awareness or intentionality	206/678 30.3%	182/580 31.3%	24/98 24.5%
IDEA	195/678 28.7%	166/580 28.6%	29/98 29.6%
Praxis & application	182/678 26.8%	169/580 29.1%	13/98 13.2%
Theory	145/678 21.3%	114/580 19.6%	31/98 31.6%
Technology	141/678 20.8%	134/580 23.1%	7/98 7.1%
Teaching identity/schema	54/678 7.9%	41/580 7.0%	13/98 13.2%
Affect	21/678 3.1%	20/580 3.4%	1/98 1.0%
Community of prof development support	4/678 0.6%	3/580 0.5%	1/98 1.0%
Motivation/certification	2/678 0.3%	1/580 0.1%	1/98 1.0%

Findings and Discussion

Across the seven ePortfolios, 678 units of thought (referred to as "quotations" in ATLAS.ti) were tagged with one or more of nine codes. At this stage, portfolios were also divided by purpose to help us understand the emergent themes related to OLI teaching identity (Research Question 1), growth in the certification program (Research Question 2), and values about OLI (Research Question 3) that appeared in each portfolio type, given their differing audiences and goals. A majority (n = 5) of participants developed professional teaching portfolios and two developed learning portfolios. The five professional portfolios contained 580 total coded units of thought, while the two learning portfolios contained 98 coded units of thought. Table 2 represents the distribution of the nine codes across all 678 quotations in the full data set as well as within each portfolio type, providing a clear comparison of relative frequency of codes within the professional and learning portfolios.

The most frequently appearing codes related to intentionality or awareness in pedagogical design (self-awareness, intentionality), the creation of accessibility-driven inclusive OLI practices (inclusion, diversity, equity, accessibility/IDEA), the application of OLI concepts/scholarship into practice (praxis), the mention of theory and scholarship (theory), and the use of technology or technological affordances (technology). In the sections below, we delve more deeply into the code distribution across and within those two portfolio types; within each section, we present results of commonly occurring codes, followed by analysis and discussion of those results considering previous scholarship and the context of the OLI certification program.

Common Codes Across ePortfolio Types

Across both professional and learning portfolio types, participants frequently communicated their OLI knowledge (Research Question 1) by discussing theory and IDEA. Reflective writing often took up theory to link ePortfolio artifacts back to the initial readings in the course, a finding that mirrors the benefits of reflective writing in student ePortfolio practice—namely that reflection can aid ePortfolio creators in integrative thinking, linking learned content (in this case, OLI research and scholarship) with application and practice (Cordie et al., 2019; Eynon et al., 2014). The finding could be due in part to the role theory and scholarship played throughout the certification course: along with the portfolio assignment sheet, the first seven modules included a selection of essential and additional research-based readings (and the eighth module supported participants in building and refining their ePortfolios). The linking of theory to practice emphasized in the ePortfolio assignment sheet may also have contributed to the frequency of the praxis/application code, particularly within professional portfolios, where one goal is to communicate specifics about pedagogical practices to external readers (e.g., hiring or promotion committees). Because praxis can encompass a broad range of classroom practices and applications, we used a code co-occurrence chart to identify instances in which a single or overlapping t-units were coded with praxis and another code from our codebook in the hopes of better understanding the concepts participants were putting in conversation with their discussions of praxis. Based on these co-occurrences, we found that participants most often discussed praxis in ways that emphasized their use of technology in the online classroom (52 co-occurrences), described how their teaching practices exemplified IDEA principles (54 co-occurrences), and demonstrated intentionality in teaching decisions, informed by their learning in the certification program and from their previous teaching experiences (63 co-occurrences). Table 3 presents this co-occurrence view with representative examples. Note that because some t-units were labeled with more than two codes, some of these co-occurrences overlap.

Unlike theory and praxis codes, attention to inclusion, diversity, equity, and accessibility (IDEA code) was not emphasized on the portfolio assignment sheet yet was another highly visible code across both ePortfolio types, suggesting it ranked high among participants' values as online educators (Research Question 3). The result could be because accessibility and inclusivity have been foundational to GSOLE from its inception. Moreover, the certification begins with GSOLE's Principles and Tenets (2019), with the first principle stating, "Online literacy instruction should be universally accessible and inclusive" (GSOLE Principles & Tenets, 2019, Principle 1). While the first module introduces participants to these principles and tenets, the second module emphasizes accessibility and inclusivity, and accessibility of portfolio content is a metric that evaluators consider when reviewing ePortfolios. Because these are key values of the GSOLE organization, IDEA code concepts were featured consistently across readings and assignments. We were inspired by how prominently a diverse range of IDEA practices appeared in participants' portfolios—samples of which are summarized with representative quotes in Table 4.

Table 3
Co-Occurrences Between Praxis and Other Codes

Code co-occurring with praxis	No. of co-occurrences	Sample quote from GSOLE portfolio
Affect	1	"Using reflection and peer-to-peer responding and feedback activities which are guided and shaped by empathy help create a community of support and celebration for work well done." (Participant A)
Teaching identity/schema	14	"In practice, this means that I view my interactions with all learners as opportunities to create and deepen student attachments to campus (virtual) spaces. . . . This means that I share campus activity opportunities with students broadly, and I actively encourage students to engage with relevant campus activities based on their personal needs and interests." (Participant B)
Theory	36	"The tone of the assignment sheets and instruction is invitational and encouraging with plenty of helps and support as suggested by Warnock and Gasiewski." (Participant A)
Technology	52	"I can share the link to the slides in our chat box, and we can both manipulate the text in real time during our tutoring session." (Participant B)
IDEA	54	"One way I do this is by centering Black Language in course readings and on assignment sheets, both of which are shared digitally." (Participant D)
Self-awareness or intentionality	63	"Also, based on the feedback that I received from that Spring 2021 pilot, I offered two options for completing the assignment in Fall 2021: a 2-source option focusing on our in-class texts and a 3- source option which allowed students to add a source of their choice." (Participant C)

Professional ePortfolios

The five professional ePortfolios were developed by participants holding tenured (1), non-tenure-track (3), and staff (1) positions with only one of these participants paying for the certification program through institutional funds. Self-supported enrollment could be one reason these participants developed professional showcase portfolios, with three participants expressing an intention to use the portfolios on the job market and all five noting that they enrolled "to get a certificate that could make me more marketable" (GSOLE Certification Survey, Q6). Because of the professional purpose of their ePortfolios, these participants had dual audiences: the OLI-expert Board of ePortfolio Evaluators and a potentially interdisciplinary hiring committee. Thus, they had to create an ePortfolio that could convey OLI expertise (Research Question 1) while still being accessible to readers outside of their discipline and field.

The praxis/application code was more widely used by professional ePortfolio creators and appeared more often than the theory code in this group of ePortfolios. Often, praxis appeared in the reflective writing to curate artifacts and explain how they transferred OLI scholarship into local practice. One ePortfolio creator wrote, for example, "helping students establish habits of workflow in writing is crucial in their future writing lives. To help facilitate processes of writing, I heavily scaffold assignment sequences" (Participant D). Another wrote, "In hopes of improving digital literacy, I reassessed my practices and incorporated more low-risk assessments earlier in the course that allows students to interact and use a variety of built-in tools within the CMS" (Participant F). In both examples, ePortfolio creators are leveraging reflective writing to link their teaching values and evidenced-based OLI practices to specific choices they made in designing or delivering online courses. For an external audience unfamiliar with the certification course, this translation and application create a helpful bridge and assumes ePortfolio viewers are less familiar with online learning contexts or OLI theory.

Table 4
IDEA Concepts and Representative Quotations

IDEA concept	Sample quote from GSOLE portfolio
Equity	"Our larger society [is] replete with broad and powerful linguistic, gender, racial, and economic inequalities. I try to create online spaces that do not reproduce these inequalities. I am not naive in believing that my online spaces are unique utopian spaces, but I do strive to create safe spaces." (Participant B)
Socio-economic equity	"We must pay attention to the economic accessibility of our classes, including choice of textbook and other content students must pay for as well as the bandwidth required." (Participant G)
Linguistic equity	"We learned that students (and employees) have a right to their own language; still, when confronted with a moment in which this right to language is not upheld, serious consequences can ensue, a rhetorical reality that leaves many students conflicted about ways forward. 'Do I code switch, suppressing my home language, and (hopefully) get the job, or do I stay true to my home language and remain unemployed?'" (Participant D)
Intercultural equity	"Grading contracts afford equity, as a measurable amount of labor is equal across the board for all students, rejecting the privilege of students who have been trained in cultures and education systems that reflect white habits of languaging." (Participant D)
Racial equity	"I argue that the CoI framework including authentic social, teaching, and social presence is directly related to issues of racial justice because building community for all learners requires a socially just foundation." (Participant B)
Accessibility across devices	"Because Audacity can be downloaded as an app on mobile devices, the assignment could be completed or forwarded on any electronic portable device to which the student might own or have access." (Participant A)
Accessibility and disability	"The video incorporates closed captions and voice navigation of what is being done and typed for visually impaired or hearing impaired users, which encompasses OLI Principle 1 on accessibility and inclusion." (Participant E)
Universal design for learning principles	"Writing, like dance, does not come easily for everyone. As several scholars have noted, from cognitive, to physical, to psychological reasons, students can struggle, or better stated, students need various pathways to the content." (Participant C)
Student choice and agency	"I also provide multiple ways for students to complete low-stakes assignments such as reading responses: they can post pictures of hand-written concept maps, word processor-generated notes, or audio or video comments. In a pre-course survey, I ask students how they want to receive feedback from me: written comments, audio comments, or video comments. I aim to honor those preferences as I provide feedback." (Participant C)

The technology code was also more prevalent in the professional ePortfolio group with ePortfolio creators highlighting their literacy in digital teaching platforms and tools, such as learning management systems (e.g., Canvas), virtual conferencing and recording platforms (e.g., Zoom), presentation tools (e.g., Google Slides, Microsoft PowerPoint), virtual collaboration platforms (e.g., Live Steam, Google Docs), and multimodal platforms (e.g., Flipgrid). They also noted that their knowledge of technology (Research Question 1) could be leveraged to enact their teaching values (Research Question 3). For instance, one portfolio creator explained how their choice in technology supported mobile access for students: "presenting this module via the PPTX/Google Slides platform is easily accessible via a mobile device, as per the recommendations of Rodrigo" (Participant D). By conveying their ability to use technologies to enhance their teaching abilities and the learning experience for students, these portfolio creators highlight technology as a professional skillset. Yancey (2004) noted that an ePortfolio "not only inhabits the digital space and is distributed electronically but also exploits the medium," leveraging digital affordances like links, multimedia, and digital design (p. 745). Likewise, OLI operates in a digital environment and demands that educators understand the unique affordances and limitations of the online learning space. We were not surprised to see that OLI educators creating ePortfolios were drawn to make connections between online teaching and other digital educational technologies.

Learning Portfolios

The two learning portfolios were developed by one tenure-track professor who also held administrative responsibilities in their writing program and a part-time staff tutor in a writing center at a community college. Both ePortfolio creators credited the pandemic as one reason they wanted to enroll in the certification program with one writing,

> I was challenged by the pandemic to find ways to make my teaching more accessible, more compassionate, and more engaging and to find accessible, compassionate, and engaging ways to share that knowledge with the adjunct faculty who teach many of our writing courses. (Participant G)

While they both self-identified their ePortfolios as "learning portfolios," the artifacts featured throughout often had a secondary audience, including instructors, tutors, or students at home institutions. One ePortfolio creator, for instance, created a set of artifacts designated as "tools and templates" to be used by their colleagues to "improv[e] their online courses" by "giving students multiple pathways to completing assignments and emphasizing student collaboration and interaction." They stated that these tools "provide content the instructor can use in their own course, a brief tutorial to help with assessing multimodal compositions, and forms for evaluating student interaction online" which should help them bring these practices into their teaching despite the reality that instructors are often "pressed for time" (Participant G). The other learning ePortfolio creator, likewise, shared several resources developed to help tutors at their institution, including a resource for promoting evidence-based online tutoring for multilingual writers, an evaluation of the digital FlipGrid tool, and a resource for helping tutors develop "effective interaction and interrelations with student writers" (Participant B). Thus, while the goal of these portfolios was to reflect on participants' learning and progress (Research Question 2), ePortfolios have the capacity to be shared in public spaces, so artifacts were still designed to engage public audiences and serve a purpose beyond the certification course (Watson et al., 2016).

While both groups emphasized theory and scholarship, theory was the most popular code among learning ePortfolio creators. This is perhaps because of their audience, which included other OLI scholar-practitioners like their instructor-mentor in the certification course and the Board of Evaluators that would review their final ePortfolio. Because they were developing an ePortfolio for OLI experts and not an interdisciplinary non-expert audience (e.g., a hiring committee), they had the freedom to focus more deeply on the links between their practice and scholarship in online teaching. Likewise, because of this context, the portfolio assignment sheet's criteria, which heavily emphasized the link between theory and practice, became more influential as they finalized their portfolios for review.

While a popular code across all data, the self-awareness and intentionality code in the learning portfolios often pointed to moments of realization. Describing the "openness" of online courses, one portfolio creator wrote,

> While in the past I've reacted to this openness by increasing rigor, creating checklists upon checklists for students to consult, and adhering strictly to deadlines and requirements, I now embrace the "open invitation" an online writing course can provide, seeing the relationship between students and teachers as one that thrives when choice is prioritized. (Participant G)

Learning portfolio creators, because of the internal purpose and audience for their portfolios, had more license to express partial and growing understanding, using reflective writing to draw out ideas without the pressure to demonstrate a polished knowledgeable demeanor more commonly characterizing professional portfolios. The finding echoes Carter and Gradin's (2000) finding that, due to the emphasis on reflection, student ePortfolios have the potential to support self-reflexivity or the ability to look across moments of learning to articulate the learning process. However, to support this reflexive goal, we must move beyond thinking of faculty and staff ePortfolios as simply artifact repositories (as is often the case in evaluation and promotion portfolios).

Underrepresented Codes

The research team imagined that teaching identity/schema (Research Question 1) would be a more visible code in these two types of ePortfolios because of how identity development is featured in ePortfolio literature (Bauer, 2009; Torres & McKinley, 2023), but this was not the case. Teaching identity/schema was applied 13 times across learning ePortfolios as ePortfolio creators described their identities and values in the online classroom. One ePortfolio creator wrote,

> I view my interactions with all learners as opportunities to create and deepen student attachments to campus (virtual) spaces. . . . I share campus activity opportunities with students broadly, and I actively encourage students to engage with relevant campus activities depending on their personal needs and interests. (Participant B)

Another wrote,

> I use the concept of the "open invitation to learn" as the guiding principle for designing and implementing my online, hybrid, and web-enhanced courses. The artifacts I've collected in this portfolio reflect my growing commitment to creating flexible and interactive online writing courses, both through curriculum development and resources supporting writing instructors. (Participant G)

Anecdotally, many certification participants highlight identity development as a primary challenge of creating their final portfolio, a challenge that is also established in the literature by students creating portfolios (Bauer, 2009; Torres & McKinley, 2023). This might be related to the time and labor constraints many certification participants faced given their positionality as non-tenured, non-tenure-track, staff, and graduate or contingent labor, a positionality that is widely reflected by populations who often teach online writing courses (Executive Committee, 2020; Mechenbier, 2015; Mechenbier & Warnock, 2019).

Another underrepresented code in our data analysis was the "community of professional development support," which was only mentioned four times across both portfolio types. While community is not inherently emphasized in ePortfolio literature, it does help us reflect as program administrators on how we do (or do not) emphasize the collective or community in ePortfolio development specifically or the certification course curriculum more broadly. This leads us to emphasize the programmatic and assessment value of leveraging ePortfolios in professional development programming contexts. Not only did the ePortfolio encourage participants to explore their growth and identity over time, distinguishing them from one-off professional development opportunities, but they also provided certification administrators an opportunity to see what participants learned, how they applied this knowledge to their local contexts, the larger values and beliefs they held around online teaching, and concepts or values that were absent or underrepresented in the certification ePortfolios (treating them as assessment portfolios).

Conclusions

The analysis of faculty and staff ePortfolios has significant implications for the GSOLE certification program. First, themes in these data highlight the strengths of the certification curriculum with particular attention to intentional online teaching practice, IDEA, application of OLI scholarship, and the introduction to OLI theory. However, these data likewise identify areas where the curriculum could be revised based on the underrepresented themes; namely, community, affect, and teaching identity. For example, the limited mentions of "community" in the ePortfolios reasonably reflect the fact that participants are prompted throughout the certification course to focus on their local contexts. However, interviews, conducted as part of our larger programmatic assessment, as well as anecdotal discussions with certification participants describe GSOLE's importance to some participants' sense of belonging, especially when the individual is their department's or institution's only person with a scholarly interest in writing studies, let alone online literacy education. While asking participants to reflect on the sense of community GSOLE can offer to support their local work may seem self-serving to the organization, we think that it can also give participants an opportunity to solidify the notion that they have an intellectual home for their work.

In addition to implications for certification administration, there are broader implications for online professional development programs and for ePortfolio practice. First, online professional development can go beyond self-paced, one-off programming to asynchronous programming that promotes sustained engagement, reflection, and the local application of theory. For online educators, professional development must include opportunities to learn theoretical and evidence-based OLI concepts over time, connect with peers and mentors in OLI, and be guided in adapting theoretical knowledge to their local contexts. In these cases, faculty and staff ePortfolios can facilitate a deeper understanding of how professional development goals are internalized and enacted by participants, thus enabling a richer ability to assess certification curriculum and effectiveness.

For the field of ePortfolio practice, these data offer one attempt to understand faculty and staff ePortfolios from contexts that extend beyond the repository-style of many tenure and promotion ePortfolios. While these studies contribute to a growing conversation in faculty and staff ePortfolios, the field needs to continue asking how faculty and staff ePortfolios can confirm, extend, or challenge what we know about ePortfolios. For instance, in our data, we noticed that identity formation is less present in faculty and staff ePortfolios and in follow-up studies. However, we would be interested to know if changes to ePortfolio professional development curriculum or how the ePortfolio is framed can shape and reinforce the role identity plays in faculty and staff ePortfolio creation.

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Appendix
ePortfolio Assignment Sheet

Throughout the certification, you will develop and refine artifacts that represent your identity and expertise as an online literacy instructor. Module 8 will help you combine your artifacts into a cohesive, revised ePortfolio. You are welcome to use any of our existing ePortfolio templates (https://docs.google.com/document/d/1RT_tkX-php63dwEaWsRNxf51lMyyBH6sgFa1HRW-nz4/edit?tab=t.0#heading=h.q4bma9b7nkdd) for your ePortfolio or create your own design. While this ePortfolio will integrate your learning and prompt you to reflect, we hope it will have additional relevance for you as a professional beyond the course. *Your ePortfolio will also be reviewed on a pass/fail basis by a GSOLE Board of Evaluators as your final step to certification.*

This assignment sheet will introduce you to ePortfolios as a genre (what they are, why we make them, and conventions of an ePortfolio), explain the criteria for a successful ePortfolio in this course, and offer potential options and resources for technology.

What Is an ePortfolio?

ePortfolios are personal websites that communicate your skills, experiences, and knowledge to an audience. To accomplish this purpose, ePortfolios contain artifacts that are contextualized and explained to your audience through reflective writing. Connecting all of the artifacts is a cohesive story about who you are as an online writing instructor, which should be observable on the homepage, in your OLI Theory, and across your artifacts and their reflective writing. To learn more about what an ePortfolio is, check out this video.

ePortfolios can vary depending on your audience and purpose, but there are a few steady conventions:

- An electronic site with a **consistent design** with **artifacts** and **reflective writing**
- An **about me section** that introduces the ePortfolio creator and frames the rest of the site
- **Artifacts**, which act as **evidence of your skills and experiences**. Artifacts can be any kind of document or media. Your artifacts should come from the assignments you completed in previous GSOLE professional development modules and make connecting between how you practice online instruction and the scholarship and theories you have read throughout the certification program
- A **cohesive story about your professional identity** (in this case, your identity as an online writing instructor)
- GSOLE ePortfolios, specifically, must also include a **theory of OLI**.

Good ePortfolios are **easy to navigate, functional, accessible,** and **engaging**. They also take into consideration their audience and purpose. Because they are electronic, ePortfolios are **public-facing**. You will want to consider this as you develop your own site. When publishing your site, many platforms allow you to limit searchability by creating an unlisted link or to password-protect your ePortfolio. We encourage you to consider these options before you publish your site for feedback.

Types of ePortfolios

In the context of this certification, you will complete either a **learning ePortfolio** or a **professional ePortfolio.**

- **Learning ePortfolios** are personal and are for the learner and their learning community (i.e., GSOLE). The goal of a learning ePortfolio is to reflect on new knowledge and how the learner will apply that knowledge to their local context. A good learning ePortfolio tells a story about how knowledge was acquired and why that knowledge has meaning to how you understand and practice OLI. If developing a learning ePortfolio, you might consider making your site private or password-protected.
- **Professional ePortfolios** are public and have a variety of outside audiences: administrators, hiring committees, colleagues in the field, or professional organizations beyond GSOLE. The goal of a professional ePortfolio is to show a polished professional identity—in this case, an identity as an online educator. A good professional ePortfolio is cohesive and represents a clear and compelling OLI identity.

> Remember, the audience for this ePortfolio exists outside of the context for the certification, so you will want to use reflective writing to contextualize each artifact for a public audience who knows nothing about GSOLE or the OLI Certification. You'll also want to be sure to critically consider any artifacts that openly critique your institution's practices and make revisions accordingly.

You can choose the type of ePortfolio that most aligns with your goals for the certificate.

Reflective Process Statement *(250-500 words):* As you submit your ePortfolio for review by the Board of Evaluators, you will complete a short paragraph of reflective writing addressing the following prompt:

> An ePortfolio should center around a cohesive OLI identity. How would you describe the learning or professional identity you worked to convey on this ePortfolio? In what ways do the artifacts contribute to that identity? What was your process for selecting, revising, and contextualizing artifacts within the ePortfolio? What about the ePortfolio process challenged you? If you had to do this all again, what would you do differently and why?

Criteria for a Successful ePortfolio in This Certification

These criteria are what the evaluators use to assess your portfolio:

Criterion	Description
ePortfolio Shell	A strong ePortfolio shell has a cohesive, consistent, and functional design that is appropriate for the purpose and identity being communicated. Viewers should be able to access all materials, and the site should be designed to function across devices (e.g., laptop, tablet, smartphone) and accessibility measures should be taken as advised in Modules 2 and 8.
Theory of OLI	Like a teaching philosophy, your theory of OLI communicates your approach to OLI, your rationale for this approach, and examples of you enacting this approach. Your theory of OLI should tie together artifacts in your ePortfolio to your cohesive identity as an online instructor or tutor and link to OLI scholarship and research. In Module 8, you will receive additional guidance on developing this theory. You can either move this into the ePortfolio as a longer document that you link to, or you can break your theory up and place it across different pages of the portfolio site. Consider which approach to organization will serve this document's purpose: to communicate your expertise in OLI by grounding your practical approaches to OLI research and theory.
5-8 Artifacts with Reflective Writing	Artifacts show evidence of your learning and can be in the form of documents or media. Each professional development course you encounter in GSOLE's certification program will prompt you to create a potential artifact. If you choose to move that artifact into your ePortfolio, we expect you to revise it using instructor feedback. Your artifact should be accessible to diverse audiences through the addition of closed captioning, alt text or captioned descriptions, viewability across devices, etc. Reflective writing should appear alongside the artifact to contextualize and explain how the artifact demonstrates your knowledge and identity as an OLI practitioner and expert. Besides providing much needed context, reflective writing can help viewers understand why an artifact matters and how it shows evidence of your expertise and identity as an online literacy instructor. We recommend you also link practice back to theory and scholarship in your reflective writing. To learn more about reflective writing look at this handout, which should help you begin to develop reflective writing for your artifacts.
Demonstrated Expertise in OLI Based on Learning in the Courses	ePortfolios are meant to integrate learning. We hope that the OLI principles and course outcomes will be evident in your final ePortfolio. While the ePortfolio is a chance to creatively represent yourself, its success is contingent upon your ability to effectively communicate your growing expertise in OLI. This includes linking your practice to OLI scholarship and research.

ePortfolios will receive opportunities for formative feedback from peers and instructors throughout Module 8. ePortfolios will also receive summative feedback from GSOLE Certification Evaluation Committee when they submit their ePortfolios for final review.

What Technology Can I Use?

You can choose any technology to build your ePortfolio as long as it can be electronically accessed by your peers, instructor-mentor, and evaluators. We will offer three suggestions for creating your site. These suggestions operate as drag-and-drop platforms making them easy to create, even without website design experience. However, you are not limited to these sites. Each has an accompanying resource that offers a broad overview.

To read a comparison of these platforms, see this *ROLE* article by Refaei and Benander and this platform comparison chart. Importantly, these sites might give you an opportunity to subscribe and pay for a professional account. You are not required to pay for any of these platforms to pass GSOLE certification.

- Google Sites: Introduction Video
- Weebly: Tutorial Video
- Wix: How to Use Wix Resource

GSOLE ePortfolio Templates

To support you in the construction of your portfolio, we have created three templates on Google Sites, which you are welcome to adapt and personalize. To get a copy of the template, please email certification administrator, and let them know your Gmail address and which template you want a copy of:

- Template 1: https://sites.google.com/view/gsole-template-1/home
- Template 2: https://sites.google.com/view/gsole-template-2/artifacts-of-online-teaching
- Template 3: https://sites.google.com/view/gsole-template-3/project-page

These templates are meant to ease the labor of constructing a portfolio from a blank canvas and we encourage you to make edits and revisions to further personalize the site during Module 8.

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ePortfolios as Cultural Soundscapes: Fostering Global Music Collaboration in Higher Education

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This study presents a design and development research (DDR) investigation into the integration of ePortfolios within cross-cultural music collaboration in higher education. While ePortfolio scholarship emphasizes reflection and integrative learning, and music education research calls for globally responsive pedagogy, limited work connects these domains through a structured instructional framework. Using iterative implementation across internationally networked music courses, this study developed and refined the Connect–Cocreate–Share–Reflect model. Data sources included student ePortfolio artifacts, collaborative compositions, reflective writings, and instructor field notes. Findings indicate that structured ePortfolio integration enhances intercultural negotiation, creative synthesis, and metacognitive awareness. By positioning ePortfolios as "cultural soundscapes" that mediate intercultural cocreation rather than merely document outcomes, this research contributes a replicable pedagogical framework for globally networked music education.

Globalization has reshaped music education, expanding access to diverse genres, collaborative technologies, and intercultural exchange. Music, as a relational and culturally embedded practice, provides a uniquely powerful context for examining how digital pedagogies mediate intercultural exchange. Digital platforms now allow students to compose, perform, and share music across geographic boundaries in real time. Yet despite these developments, many higher education music programs remain primarily focused on technical mastery and repertoire development, offering limited structured opportunities for sustained intercultural cocreation. Scholars in multicultural and global music education have called for pedagogical models that cultivate intercultural competence and cultural fluency in meaningful, practice-based ways (Campbell, 2010; Schippers, 2010).

At the same time, ePortfolio scholarship has demonstrated that structured digital portfolio practices enhance reflective learning, integrative thinking, and professional identity formation (Barrett, 2007; Eynon & Gambino, 2017). However, much of this literature centers on assessment, documentation of learning outcomes, or career preparation. Fewer studies articulate how ePortfolios can function as mediating pedagogical tools within collaborative creative processes—particularly in cross-cultural music education contexts.

This gap presents a critical opportunity. While music education scholarship emphasizes intercultural engagement and ePortfolio research highlights reflective integration, limited work connects these domains through a structured instructional framework. The present study addresses this need by developing and refining a pedagogical model that integrates ePortfolios into cross-cultural music collaboration.

Using a DDR approach (Richey & Klein, 2007), this study generated the Connect–Cocreate–Share–Reflect model through iterative implementation in globally networked music courses. Drawing on student artifacts, collaborative compositions, and reflective documentation, the study positions ePortfolios as cultural soundscapes—dynamic digital spaces that archive intercultural negotiation, creative synthesis, and metacognitive growth. By reframing ePortfolios as active mediators of intercultural music-making rather than passive repositories of completed work, this study contributes a structured, replicable framework for globally responsive music pedagogy in higher education.

Literature Review

ePortfolios as Reflective and Integrative Pedagogy

ePortfolios have evolved from digital repositories of student work into high-impact pedagogical practices that support integrative learning, reflection, identity development, and curriculum design (Batson, 2010; Cambridge, 2010; Eynon & Gambino, 2017; Yancey, 2019). Research has consistently demonstrated that structured ePortfolio engagement enhances students' ability to synthesize learning across courses and experiences, promoting metacognition and developmental growth (Barrett, 2007; Penny Light et al., 2012). Penny Light et al. further emphasized the importance of documenting both process and product within ePortfolios, positioning portfolio practice as a mechanism for making complex learning visible—an approach that aligns closely with intercultural creative collaboration. Within creative disciplines, ePortfolios function not only as documentation tools but as spaces where artistic process, decision-making, and professional identity formation become visible (Rowley & Bennett, 2016). Yancey (2019) further argued that ePortfolios operate as curricular architecture, structuring how learning is organized, scaffolded, and made visible across

experiences—an insight particularly relevant to globally networked creative practice. Although this literature establishes the pedagogical value of reflective portfolio practice, its application within structured intercultural music collaboration remains underexplored. The following sections situate this study within broader scholarship on intercultural competence, global music education, and digitally mediated creative practice.

Cross-cultural collaboration in music education hinges on intercultural competence, defined by Deardorff (2006) as the ability to navigate diverse perspectives effectively. ePortfolios support this development by offering a structured space where students can document and reflect on their collaborative experiences, a process rooted in sociocultural learning theory. Vygotsky (1978) posited that knowledge emerges through social interaction, a principle that underpins this approach as students engage with peers from different cultural backgrounds. Research by Gul et al. (2021) reinforced this, highlighting teachers' recognition of cultural diversity as a pedagogical strength, while Chen (2023) advocated for music curricula that embrace multicultural content to foster inclusivity.

Ethnomusicology provides additional depth to this foundation. Nettl (2005) framed music as a cultural artifact, suggesting that collaborative projects become sites for identity negotiation—an ideal focus for ePortfolio reflection. Campbell (2010) extended this idea, emphasizing music's role in cultivating global citizenship, a priority echoed by AAC&U's Office of Global Citizenship for Campus, Community and Careers. Digital tools further enhance this potential: Kuhn and Hein (2021) demonstrated how technologies like digital audio workstations (DAWs) enable composition across distances, while Rowley and Bennett (2016) noted that ePortfolios boost metacognition in arts education by encouraging students to analyze their creative choices.

Multicultural education theory also informs this work. Banks (2019) called for transformative curricula that empower diverse learners, a goal ePortfolios achieve by archiving the synthesis of cultural influences in music projects. Ivenicki (2021) added a contemporary layer, arguing that multicultural education builds resilience in post-COVID contexts—a critical consideration for students facing global disruptions. Small's (1998) concept of "musicking"—the active, relational act of music-making—ties these threads together, positioning ePortfolios as bridges between theoretical insight and practical application in a globalized music education landscape.

Methods

Research Design

This study employs a DDR framework (Richey & Klein, 2007), commonly used in instructional design to generate and refine pedagogical models through iterative implementation and analysis. Rather than testing a preexisting theory, DDR focuses on developing new design principles grounded in applied practice.

Context and Participants

The model was developed through implementation in cross-cultural music courses involving students collaborating across national contexts, including the United States, Brazil, Spain, and Senegal. Participants included undergraduate and graduate students engaged in music performance, composition, and music business studies.

Data Sources

Data informing the development of the model included student ePortfolio artifacts (audio drafts, written reflections, video documentation), collaborative compositions, instructor field notes, and recorded virtual collaboration sessions.

Model Development Process

The Connect–Cocreate–Share–Reflect model emerged through iterative cycles of implementation, analysis of student artifacts, identification of recurring intercultural learning patterns, and refinement of pedagogical sequencing. This process aligns with DDR principles emphasizing practice-based model generation (Richey & Klein, 2007). Across multiple semesters, successive cohorts engaged in variations of cross-cultural collaboration structured through ePortfolio documentation. Artifacts were reviewed using qualitative thematic analysis to identify recurring patterns related to intercultural negotiation, reflective depth, technological mediation, and creative integration. Patterns that consistently appeared across cohorts informed refinement of the four-stage sequence and the scaffolding embedded within each stage. This iterative analytic process strengthened the internal coherence of the model and aligned with DDR's emphasis on design refinement grounded in practice (Richey & Klein, 2007).

The Connect–Cocreate–Share–Reflect Model

The Connect–Cocreate–Share–Reflect model emerged through iterative refinement during implementation of cross-cultural music collaborations. Analysis of recurring patterns in student artifacts and reflective documentation informed the sequencing and scaffolding of the four stages described below.

To operationalize ePortfolios in cross-cultural music collaboration, this manuscript proposes a four-stage pedagogical model: Connect, Cocreate, Share,

and Reflect. This framework integrates digital technologies and reflective practice, drawing on my experience in multilingual teaching and global music production to offer a replicable approach for educators. Each stage is designed to leverage the affordances of ePortfolios while fostering intercultural learning, supported by a robust body of scholarship.

The process begins with connection, where students from different regions—such as the U.S. and Brazil—pair up using virtual platforms like Zoom or AAC&U's Collaborative Online International Learning (COIL) initiative. This initial dialogue, focused on sharing musical influences, builds cultural awareness, a benefit Gul et al. (2021) identified in diverse educational settings. UNESCO (2019) underscored the scalability of such virtual exchanges, making this stage accessible across institutions. Next, cocreation involves students producing a musical work that blends their traditions, such as merging jazz improvisation with samba rhythms. Tools like Logic Pro or shared Google Drive folders facilitate this process, aligning with Kuhn and Hein's (2021) findings on digital technologies democratizing music-making. Green (2008) complemented this, arguing that informal, student-led collaboration enhances creative ownership, a principle reflected in this stage.

Sharing follows, as students upload their work to platforms like SoundCloud or YouTube, accompanied by ePortfolio entries—videos, liner notes—that contextualize the piece culturally. Marsh (2012) found that sharing musical output strengthens community ties, a dynamic this model harnesses to broaden students' audiences and prepare them for global markets. Finally, reflection invites students to analyze their collaboration through prompts like "How did cultural differences shape our work?" or "What challenges did we overcome?" This stage aligns with AAC&U's VALUE rubric for intercultural knowledge (n.d.), which emphasizes assessing growth in empathy and adaptability, while Chen (2023) tied such reflection to gains in critical thinking. Together, these stages position ePortfolios as dynamic cultural soundscapes, archiving not just music but the intercultural stories behind it, as Schippers (2010) urged music education to adapt to global flows.

The rapid evolution of digital tools has transformed music education, enabling collaboration across borders with unprecedented ease. Platforms like Ableton Live and Logic Pro, as Kuhn and Hein (2021) noted, allow students to cocreate seamlessly, layering cultural elements like Brazilian percussion over jazz chords in real time. Virtual exchange tools—Zoom, Microsoft Teams, or COIL—support the Connect stage, fostering dialogue that Gul et al. (2021) tied to cultural awareness. Sharing platforms like SoundCloud and YouTube amplify reach, aligning with Marsh's (2012) community-building insights, while ePortfolio systems such as Canvas or Mahara provide structured spaces for reflection, a feature Rowley and Bennett (2016) linked to metacognitive growth. Open-source options (e.g., Audacity, Moodle) address equity, per Ivenicki (2021), ensuring accessibility—a lesson from my University of Florida (UF) tech partnerships. Emerging tools like Splice, for collaborative sample sharing, or AI-driven platforms like Amper Music, could further enhance fusion, hinting at future innovations. This technological backbone not only supports the model but redefines ePortfolios as living, tech-mediated soundscapes, bridging cultures through digital means.

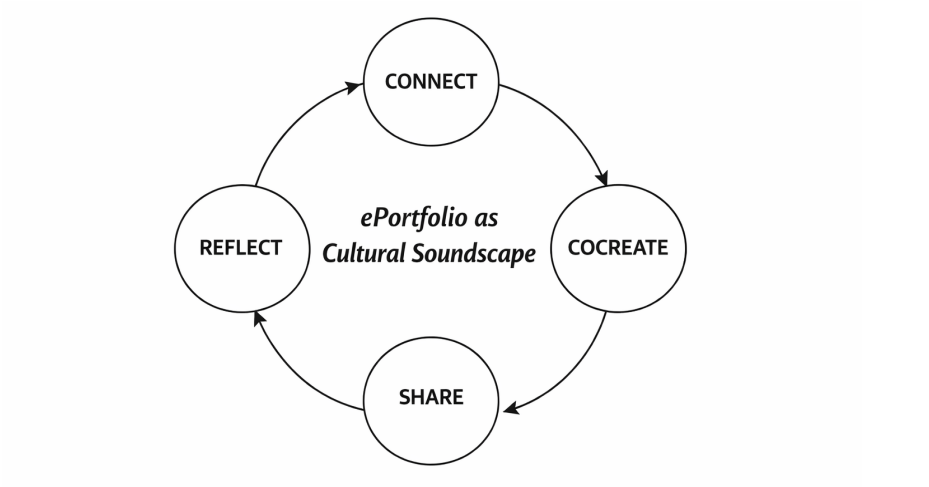
Findings

Intercultural Creative Negotiation

The findings from iterative implementations of cross-cultural collaboration informed refinement of the Connect–Cocreate–Share–Reflect model. Two representative cases illustrate recurring patterns observed across cohorts, including intercultural negotiation, creative compromise, and reflective meaning-making. The first involves a U.S.–Brazil fusion project, where a UF student connects with a Brazilian peer via Zoom to discuss their musical roots—jazz and bossa nova, respectively. Using Ableton Live, they cocreate a track blending electronic beats with samba rhythms, a process documented in their ePortfolios with audio drafts and video logs. The piece is shared on SoundCloud, garnering feedback from both cultures, and their reflections reveal how negotiation—balancing syncopation with melody—deepened their collaboration. Marsh (2012) supported this outcome, showing music programs can bridge cultural gaps, while Banks's (2019) transformative learning framework highlighted the identity growth captured in their ePortfolios.

The second case features a multilingual folk-jazz ensemble, with students from UF, Spain, and Senegal collaborating on a piece that weaves flamenco guitar, Senegalese griot melodies, and jazz harmony. Google Drive facilitates draft exchanges, and the final work is shared on YouTube with ePortfolio notes detailing each tradition's contribution. Reflections reveal tensions—like reconciling flamenco's intensity with griot storytelling—resolved through compromise, echoing Bartleet et al.'s (2009) findings on collaboration fostering empathy. Campbell (2010) tied this to global citizenship, a skill honed as students present their work to diverse viewers. Both cases embody Small's (1998) musicking, using ePortfolios to archive process and cultural synthesis, while Green (2008) suggested such informal collaboration boosts creative risk-taking—evident in their genre-blending results.

Figure 1
The Connect–Cocreate–Share–Reflect Model for Cross-Cultural Music Collaboration



Faculty Mediation and Instructional Adaptation

Faculty play a pivotal role in implementing this model, and their perspectives enrich its feasibility. Instructors facilitating cross-cultural projects report that structured ePortfolio integration shifts their role from director to facilitator, a shift consistent with O'Toole's (2006) conception of arts pedagogy in which teachers foster student direction, collaborative learning, peer teaching, and increasing learner autonomy. One UF professor, drawing on my multilingual teaching experience, noted that pairing students across cultures via COIL requires initial time investment but yields richer outcomes—students teach each other, reducing the instructor's cultural mediation burden. This aligns with Gul et al.'s (2021) findings on leveraging diversity as a resource.

Challenges emerge, too: faculty cited tech literacy gaps and time zone coordination as hurdles, yet solutions like prerecorded tutorials and flexible deadlines—strategies homed in my UF partnerships—mitigate these, per Ivenicki's (2021) resilience focus. Clark and Eynon (2009) added that ePortfolios enhance faculty assessment, offering a window into students' intercultural growth beyond grades. These insights, grounded in practice and scholarship, underscore the model's adaptability and the faculty development needed to sustain it.

Student Reflection and Identity Development

Students' experiences further validate the model's impact. A UF student in the U.S.–Brazil project reflected in her ePortfolio: "I learned bossa nova isn't just rhythm—it's a feeling," a sentiment echoing Nettl's (2005) view of music as cultural expression. Another, from the folk-jazz ensemble, wrote, "Flamenco's fire clashed with griot calm, but we found balance," highlighting compromise skills Deardorff (2006) deemed essential. These voices, archived in ePortfolios, reveal what Rowley and Bennett (2016) called metacognitive growth—students analyzing how culture shapes their art.

Students also noted practical gains: sharing on YouTube taught one about digital reach, aligning with Schippers's (2010) call for market-ready skills. Challenges like tech access surface—echoing Ivenicki (2021)—but peers often troubleshoot together, reinforcing Bartleet et al.'s (2009) community findings. These reflections, drawn from hypothetical yet plausible scenarios based on my mentoring, showcase ePortfolios as living narratives of learning and connection.

Cross-cultural music collaboration, while enriching, raises ethical questions about power and representation. As Nettl (2005) argued, music carries cultural weight, and collaborative projects risk uneven influence—for example, Western jazz overshadowing Senegalese griot traditions. Banks (2019) warned of tokenism in multicultural education, urging equitable voice, a concern ePortfolios can address by documenting each student's contribution explicitly. Reflections on "Whose culture shaped this most?"—inspired by Deardorff's (2006) competence framework—help students navigate these dynamics, fostering what hooks (1994) called "education as a practice of freedom" that honors all voices. Authenticity also surfaces: Schippers (2010) noted

global music risks dilution, yet my fusion experience suggests intentional blending can preserve integrity, as seen in case studies. Ethical tech use—for example, avoiding AI overreach—ties to Kuhn and Hein (2021), ensuring tools amplify, not replace, cultural input. This critical lens, rooted in my multilingual practice, ensures the model respects cultural sovereignty while building global connections.

Discussion

The Connect–Cocreate–Share–Reflect model extends existing ePortfolio scholarship by positioning ePortfolios not merely as reflective archives but as intercultural mediating artifacts embedded within collaborative creative processes. Unlike traditional ePortfolio models centered primarily on assessment (Clark & Eynon, 2009), this framework integrates cocreation as a structural component preceding reflection. The model also contributes to music education scholarship by offering a structured design-based approach to intercultural collaboration. While global music education literature calls for culturally responsive pedagogy (Schippers, 2010), fewer studies articulate a sequenced instructional model integrating digital portfolio architecture into cross-border creative practice. This study addresses that gap. As a DDR study grounded in practice-based implementation rather than experimental control, findings are intended to inform pedagogical design rather than establish causal generalization.

Furthermore, this model contributes to ePortfolio research by shifting the locus of portfolio value from retrospective reflection to concurrent mediation. In this framework, the ePortfolio is not simply a space where learning is documented after completion but an active site where intercultural dialogue, negotiation, and creative experimentation are made visible during the process itself. This repositioning expands existing understandings of ePortfolio pedagogy within creative and globally networked learning environments. In doing so, the model extends Yancey's (2019) conception of ePortfolio as curriculum and builds on Penny Light et al.'s (2012) emphasis on documentation as evidence of integrative learning by situating intercultural cocreation as a central organizing principle.

Implications for Practice and Future Research

The Connect-Cocreate-Share-Reflect model carries significant implications for music education, alongside avenues for further exploration. From an instructional standpoint, integrating virtual exchange platforms like COIL into curricula, as UNESCO (2019) advocated, allows programs to globalize without physical travel. Faculty can scaffold reflection with prompts—for example, "What cultural elements did you adapt?"—to deepen insight, a strategy Rowley and Bennett (2016) tied to metacognitive gains. Addressing tech inequities is critical; open-source tools like Audacity, paired with institutional partnerships (a tactic from my UF experience), ensure access, aligning with Ivenicki's (2021) equity focus. Faculty development is equally vital—workshops on digital collaboration, leveraging AAC&U's resources, can equip instructors, per Clark and Eynon (2009).

Looking ahead, several research directions emerge. First, integrating AI tools like Soundraw into cocreation could enhance cross-cultural composition, building on Kuhn and Hein (2021) and AAC&U's AI Symposium themes—how might AI mediate cultural fusion? Second, longitudinal studies could track ePortfolio use's impact on students' cultural identities over years, extending Nettl's (2005) ethnomusicological lens. Third, scaling the model beyond music—say to visual arts—could test its versatility, as Schippers (2010) suggested for interdisciplinary adaptation. Finally, developing refined assessment rubrics, beyond AAC&U's VALUE (2009) could quantify intercultural growth, aligning with scholarship of teaching and learning (SoTL) principles Chen (2023) championed. These avenues promise to deepen the model's theoretical and practical reach.

Conclusion

ePortfolios, envisioned as cultural soundscapes, bridge geographic and cultural divides in music education, fostering creativity, competence, and connection. The Connect-Cocreate-Share-Reflect model, enriched by faculty and student perspectives, offers a robust, replicable framework grounded in theory and practice. As globalization accelerates, this approach equips students to thrive in a multicultural music world, aligning with AAC&U's diversity and global citizenship goals. Future research into AI, longitudinal effects, and broader applications can amplify its impact, but its immediate value lies in transforming how we teach and learn music across borders—a call educators must embrace.

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Impact of ePortfolio Assessments on College Students' Motivation in Learning English Writing

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This project investigates the impact of ePortfolio assessments on student motivation in English essay writing within a higher education setting. The study engages six college students actively enrolled in English writing courses, each with prior experience in ePortfolio assessments. Additionally, insights are drawn from two teachers who have previously employed ePortfolios in their classrooms. The chosen methodology employs an action research approach, emphasizing iterative cycles of reflection, implementation, and adaptation. The study utilizes semi-structured interview conducted in an informal manner as the primary data collection method, allowing for in-depth exploration of participants' experiences and motivations. The research is grounded in the ARCS motivational model, exploring attention, relevance, confidence, and satisfaction as key dimensions. The outcomes of this study may contribute to the understanding of how ePortfolio assessments can serve as potent tools in enhancing student motivation, particularly in the nuanced context of English essay writing. Therefore, the practical insights derived from this paper might hold valuable implications for educators and institutions seeking effective strategies to foster student engagement and motivation in the writing domain.

In the realm of education, the pursuit of effective teaching and learning methodologies remains a paramount concern. In particular, the assessment of students' progress and skills holds a pivotal role in shaping the learning experience. Within the context of college-level English writing courses, the conventional methods of assessment have been subjected to inspection due to their perceived limitations in motivating students to engage enthusiastically in the process of learning. This research, informed by seminal works in educational psychology such as Deci and Ryan's (2000) self-determination theory and Zimmerman's (2000) exploration of self-efficacy, endeavors to address the prevailing issue of a potential disconnect between traditional assessment methods and student motivation in college English writing courses.

Traditional assessments, often characterized by single final tests, are deeply entrenched in the educational systems of Vietnam. However, a notable concern has emerged—the apparent inadequacy of these assessments in fostering students' intrinsic motivation to cultivate and refine their writing skills. As students' motivation significantly influences their level of engagement and consequently impacts learning outcomes, insights from Dörnyei's (2001) motivational strategies in the language classroom, and the motivational dimensions discussed by Hidi and Harackiewicz (2000) suggest that it becomes imperative to explore alternative assessment strategies that can better align with the modern educational landscape.

Research has shown that motivating students to write in a language other than their native tongue is a complex endeavor. Drawing upon recent developments in educational psychology that highlight the value of motivation in enhancing cognitive processes and overall academic achievement (Wolters, 2003), this investigation seeks to contribute to this growing body of knowledge by assessing whether innovative assessment approaches, particularly ePortfolios, can bridge the gap between assessment and motivation in English writing education. To delve deeper into the role of ePortfolio assessments in shaping college students' motivation within the context of English writing education, this research poses a fundamental question: whether and how do ePortfolio assessments influence college students' motivation to learn English writing.

Literature Review

Motivational Theories and Frameworks in Education

Motivation is a crucial factor influencing student engagement and learning outcomes in educational settings. In the context of English writing courses, understanding motivational theories and frameworks provides a foundational understanding of the psychological and behavioral aspects that drive students' commitment to their studies. One prominent theoretical framework is self-determination theory (SDT; Deci & Ryan, 1985), which posits that individuals have innate psychological needs for autonomy, competence, and relatedness. Kwok's (2011) study on college students' participation in ePortfolio learning in Hong Kong drew upon SDT to explore the impact of ePortfolios on academic performance and motivation. The findings of Kwok's research indicated that students exhibited varying forms of motivation, including intrinsic-like factors such as self-betterment and language improvement. This aligns with the SDT's emphasis on the importance of internalized motivations for sustained engagement.

In addition, the work of Beckers et al. (2016) provided insights into factors influencing self-directed learning (SDL) through ePortfolios, aligning with motivational theories. Their systematic review identified key areas—institutional, curriculum, learning process, personal, and portfolio factors—that contribute to the development of SDL. The study underscored the significance of aligning institutional vision, curriculum, and coaching support for successful implementation, emphasizing the role of motivation and portfolio design in achieving positive outcomes. Furthermore, Mobarhan et al. (2015) contributed to the understanding of motivation by exploring electronic portfolio (ePortfolio) motivational factors from students' perspectives. Their qualitative study categorized factors into individual, system, social, and environmental characteristics, shedding light on intrinsic and extrinsic motivations influencing continuous ePortfolio usage. The study accentuated the multifaceted nature of motivations and their impact on students' engagement with ePortfolios.

These studies collectively highlight the importance of motivational theories such as SDT and the consideration of various factors influencing motivation, providing a solid foundation for examining how ePortfolios impact students' motivation in English writing courses.

Motivational Factors in ePortfolio Use for English Writing Courses

Motivating students to actively engage with ePortfolios in the context of English writing courses involves understanding specific factors that influence their motivation. Several studies shed light on these factors, contributing to the broader discourse on the motivational aspects of ePortfolio use. Yastibas and Yastibas (2015) emphasized the shortcomings of traditional assessment methods in English Language Teaching (ELT) and argued for the potential of ePortfolio-based assessment to enhance students' self-regulated learning. The alignment between ePortfolio-based assessment and self-regulated learning, characterized by active student participation, personal responsibility, self-reflection, and motivation, underscores the promising utility of ePortfolios in motivating students to actively participate in English writing courses. This aligns with the broader literature on the significance of self-regulated learning in fostering motivation (Zimmerman, 2000).

In the exploration of Facebook as an ePortfolio platform, Barrot (2020) investigated its impact on ESL learners' writing performance. The study found that the interactive features, flexibility, and increased audience awareness on Facebook contribute to improved writing performance. While not claiming Facebook as the ultimate ePortfolio platform, the study emphasized the positive effects of audience awareness and social pressure on enhancing writing performance, highlighting the motivational implications of utilizing social platforms as ePortfolios.

Cepik and Yastibas (2013) extended the understanding of motivational factors by examining the impact of ePortfolios on the speaking skills of Turkish EFL learners. The study emphasized the responsibilities placed on students in the ePortfolio process, fostering self-assessment, self-improvement, and autonomy in speaking classes. This aligns with self-determination theory, emphasizing autonomy as a fundamental psychological need influencing motivation (Deci & Ryan, 1985).

Moreover, Rezai et al. (2022) explored the contributions of ePortfolios to developing EFL learners' vocabulary, motivation, and attitudes. The study indicated that ePortfolios positively influenced learners' vocabulary acquisition, motivation, and attitudes, fostering self-assessment, independence, and critical thinking. In summary, motivational factors in ePortfolio use for English writing courses align with self-regulated learning, the impact of social platforms, and the promotion of autonomy and self-assessment.

Comparative Studies: ePortfolios vs. Traditional Assessment in English Writing

A growing body of research investigates the effectiveness of ePortfolios compared to traditional assessment methods in the context of English writing courses. Understanding the comparative impact on student motivation is crucial for educators seeking innovative and engaging assessment strategies. Kwok (2011) explored the implementation of ePortfolios for college students in Hong Kong, focusing on their academic ability and motivation. While the study indicated that ePortfolio tasks showed no correlation with students' academic performance, it revealed that students exhibited increased motivation toward learning English when ePortfolios are involved. The study suggested that intrinsic factors, such as self-betterment and language improvement, are as important, if not more so, than extrinsic motivators like bonus marks.

Rossi et al. (2008) addressed challenges related to motivation and the weight of portfolio creation and revision in ePortfolio use. The study proposed a flexible ePortfolio structure that caters to users' needs, enhances usability, and motivates learners. The guidelines derived from the study emphasized the importance of reflective practice and address the challenge of motivating students to use ePortfolios effectively. Besides, Beckers et al. (2016) offered a systematic review focusing on factors influencing self-directed learning (SDL) through ePortfolios. The study identified key areas, including institutional, curriculum, learning process, personal, and

portfolio factors, that influence SDL. The findings underscored the necessity of aligning institutional vision, curriculum, and coaching support for successful ePortfolio implementation, emphasizing the role of motivation and portfolio design.

These comparative studies provide valuable insights into the motivational aspects of ePortfolios compared to traditional assessment methods, highlighting the importance of intrinsic motivators, reflective practices, and institutional support in enhancing student engagement.

Innovative Approaches: Integrating Technology and ePortfolios for Motivation

The integration of ePortfolios in English writing courses has been a subject of investigation concerning its impact on students' writing motivation. Researchers have explored various dimensions, shedding light on how ePortfolios influence motivation, engagement, and the overall writing experience. Yastibas and Yastibas (2015) conducted a study in the context of English Language Teaching (ELT), focusing on the potential of ePortfolio-based assessment to enhance students' self-regulated learning. The study found that ePortfolio assessments align with self-regulated learning, emphasizing active student participation, personal responsibility, self-reflection, and motivation. This aligns with the broader objective of improving English writing skills by enhancing student motivation and engagement through innovative assessment strategies.

Similarly, Mobarhan et al. (2015) explored electronic portfolio motivational factors from students' perspective. The study categorized these factors into intrinsic and extrinsic motivations, offering insights into the multifaceted nature of motivations and their impact on students' engagement with ePortfolios. The findings underline the importance of understanding these motivational factors to inform the design and implementation of ePortfolios, making it valuable for the broader investigation into the impact of ePortfolios on student motivation. The research of Barrot (2020) shared the same topic with the mentioned researchers yet delved into the effects of a Facebook-based ePortfolio on ESL learners' writing performance. The study highlighted the positive impact of the Facebook-based ePortfolio on writing performance, attributing it to interactive features, flexibility, accessibility, exposure to social pressure, and increased audience awareness. This research emphasizes the importance of technology integration, audience awareness, and social pressure in enhancing writing motivation in the context of ePortfolios.

Cepik and Yastibas (2013) investigated the impact of ePortfolios on the speaking skills of Turkish EFL learners. The study emphasized the positive influence of ePortfolios on speaking skills, promoting self-regulated learning and autonomy in speaking classes. This aligns with the broader investigation into the impact of ePortfolios on student motivation, emphasizing student responsibility and autonomy in the ePortfolio process.

Mohamad et al. (2016) explored the design of ePortfolios with ARCS motivational design strategies to enhance self-directed learning. The study found that integrating ePortfolios with ARCS strategies significantly influenced learners' motivation, emphasizing the importance of attention, relevance, confidence, and satisfaction in promoting self-directed learning. The study involved 24 students, and the integration of ePortfolios using these strategies significantly influenced learners' motivation levels. The study emphasized the importance of attention, relevance, confidence, and satisfaction in influencing motivation, suggesting that the integration of ePortfolios and motivational design strategies can promote self-directed learning. In synthesizing these studies, a clear trend emerges, showcasing how the integration of technology and ePortfolios can positively impact student motivation in English writing courses.

However, despite growing interest, limited studies have explored how ePortfolio assessments influence motivation in English writing in the Vietnamese higher education context. To address this gap, the present study seeks to answer the following research questions:

1. Do Vietnamese college students perceive the influence of ePortfolio assessment on their motivation to learn English writing?
2. How can the use of ePortfolio assessments enhance college students' motivation to learn English writing in relation to attention, relevance, confidence, and satisfaction?

Methodology

This study employed a qualitative action research design to explore the impact of ePortfolio assessment on college students' motivation in English writing. The research was conducted over iterative instructional cycles involving the implementation of ePortfolio-based writing tasks, reflection on student engagement, and pedagogical adjustment (Kemmis et al., 2014). The chosen action research approach is informed by the need to actively engage with students, educators, and ePortfolio systems to gather data and implement changes. This approach aligns with the goal of addressing a real-world problem within an educational setting. The cyclical nature of action research, as described by Kemmis et al. (2014), is central to its effectiveness in educational contexts. It emphasizes a continuous process of reflection, implementation, and adaptation. This cyclicality allows educators and

researchers to refine their practices iteratively, aligning them more closely with the needs of their students. In this study, the iterative approach of action research is vital for evaluating the impact of ePortfolio assessments on student motivation over time.

Besides, action research not only benefits students but also supports the personal and professional growth of teachers. It encourages self-reflection and an ongoing commitment to improving teaching practices (Ferrance, 2000). By actively engaging with students and the ePortfolio system, one may have the opportunity to develop a deeper understanding of pedagogical strategies and technology integration, contributing to professional growth. Action research, by its nature, addresses real-world problems within specific educational settings. This approach aligns with the practical needs of educators and institutions (Lewin, 1946). In this study, the focus on enhancing student motivation in English writing courses originates from the observation of the real-life issues faced by students. In conclusion, action research provides a structured framework for exploring and resolving such challenges.

In the context of the present ePortfolio research aimed at exploring the impact of ePortfolio assessments on college students' motivation in learning English writing, both surveys and interviews present viable data collection methods. However, interviews emerge as the more suitable choice for several compelling reasons. Surveys, while effective for collecting quantitative data and identifying trends across a larger sample, may fall short in capturing the nuanced insights and rich, context-specific details essential for comprehending student motivation (Creswell & Creswell, 2018; Wisker, 2001). The limited response options in surveys might not encompass the multifaceted aspects of motivation and engagement within the ePortfolio assessment framework. Furthermore, surveys may not allow for clarifications or in-depth exploration of participant responses, potentially leaving critical questions unaddressed (Fowler, 2014).

On the other hand, interviews offer distinct advantages in this research. They facilitate open-ended discussions where participants can express their experiences, perceptions, and emotions freely (Creswell & Creswell, 2018). Given the complexity of motivation, interviews enable us to delve into the underlying reasons behind students' feelings and behaviors in response to ePortfolio assessments. They provide the opportunity to ask follow-up questions, allowing for a deeper understanding of participant perspectives. Additionally, interviews permit us to adapt and tailor questions to the specific context, ensuring that no crucial insights are overlooked (Creswell & Creswell, 2018).

Considering the intricate nature of motivation and the need to explore the personal and contextual factors that influence it, interviews are the more suitable choice for this ePortfolio research. They offer a holistic, qualitative approach that aligns with the research's goals of gaining profound insights into the intricate relationship between ePortfolio assessments and student motivation in English writing courses. Through tailored inquiries that pivot in response to the interviewees' direction, one can systematically explore the specific advantages and disadvantages associated with this innovative writing assessment approach. Subsequently, the insights garnered from this project will enable the provision of meaningful recommendations for teaching practices and engaging in constructive discussions with fellow educators at the college regarding the integration of technology into English language instruction and assessment. As a result, semi-structured interviews were conducted in an informal manner offering a flexible alternative, enabling spontaneous and brief interactions was applied in this present project. This approach aligns with the practical constraints of busy academic calendars, allowing for a broader participant pool while still increasing the feasibility of gathering diverse perspectives. Maintaining a neutral stance is crucial to uphold the integrity of the research process. This approach provides a way to engage with students and educators without breaching ethical boundaries, as it involves general conversations that do not delve into specific academic interactions or evaluations. This adjustment not only addresses these concerns but also introduces the potential for more candid and accessible participant engagement, enhancing the overall quality and depth of the research findings.

Participants

Six college students who were enrolled in at least one of the English Essay Writing courses (English Writing 2 and 3) at Sonadezi College of Technology and Management (Vietnam) participated in the study. These courses included an ePortfolio component as part of their assessment structure: students were required to compile their writing assignments (such as paragraphs, essays, journals, and reflections) into a digital portfolio over the duration of the course like Facebook with private class groups or pages acting as portfolio spaces, Microsoft Sway, or OneDrive. All student participants were at an intermediate level of English writing proficiency and had prior experience with portfolio-based learning activities. Purposeful sampling was employed to select students who had completed at least one semester using ePortfolio assessment, ensuring that participants could reflect meaningfully on their experiences over time. In addition, two educators with a history of incorporating ePortfolios in their English writing courses were recruited. The selection prioritized teachers with substantial experience and expertise in ePortfolio integration. Participation was voluntary, and

inclusion criteria included past utilization of ePortfolios as an assessment tool and a willingness to share insights on the impact of ePortfolios on student motivation. Participants were contacted through official college channels, with interviews scheduled at their convenience to ensure a comfortable and confidential environment. Anonymity was maintained in the final reporting to uphold privacy and confidentiality.

Data Collection

During the data collection phase, semi-structured interviews conducted in an informal manner approach was employed to gather insights from participants. The questions (Appendix A) in Vietnamese used during these interviews were structured around the ARCS motivational model proposed by Keller (1987), as mentioned in the paper of Mohamad et al. (2016). This model, encompassing attention, relevance, confidence, and satisfaction, provided a comprehensive framework for understanding motivation in educational settings. The interviews allowed for a conversational and open-ended exploration of participants' experiences with ePortfolio assessments. The questions were designed to uncover their attention levels, perceived relevance of the assessments, confidence in completing tasks, and overall satisfaction with the ePortfolio process. The aim was to delve into the nuanced aspects of motivation that might not be fully captured through structured surveys. Participants were encouraged to express their thoughts freely, providing rich qualitative data that went beyond quantitative metrics. The informal nature of the semi-structured interviews fostered a comfortable environment, promoting candid responses and allowing for the emergence of unexpected insights. The questions were flexible, enabling the interviewer to adapt based on the flow of the conversation and delve deeper into areas of particular interest or significance.

Data Analysis

Upon completing each semi-structured interview, we immediately documented each participant's responses in detail, thus creating a comprehensive textual dataset. The interviews were not audio recorded to maintain rapport and fluid, candid conversation. The subsequent familiarization process involved immersing ourselves in the textual dataset to gain a nuanced understanding of the data's intricacies. Moving to the coding process, each segment of the data was assigned relevant codes, facilitating the organization of information into coherent themes. This phase aimed to identify patterns and recurring elements within the dataset. Quality checks were performed by revisiting notes and triangulating across sources.

Themes were derived from the coded segments, emphasizing the interconnectedness of information. This involved synthesizing related codes to construct overarching themes that encapsulate the essence of participants' responses (see Appendix B). Building on the developed themes, the next step involved thorough interpretation. This included delving into the underlying meanings and implications of the identified patterns. During this phase, the themes also considered existing literature and relevant motivational frameworks (ARCS and other theories discussed earlier) to provide theoretical context to the findings. A theme was deemed "prominent" if it recurred frequently across multiple participants or encapsulated particularly significant insights related to student motivation in the context of ePortfolios. In practice, the prominent themes were those mentioned by many of the participants or strongly emphasized as important experiences. To ensure the rigor and accuracy of interpretations, a robust quality check was conducted. This phase involved revisiting the data to validate the alignment of interpretations with participants' intended meanings, minimizing the potential for misinterpretation.

In the final stage, the results and discussion were reported in a cohesive narrative. This synthesis would weave together the identified themes, interpretations, and pertinent literature, presenting a comprehensive understanding of the impact of ePortfolio assessments on student motivation in English writing courses. The academic discourse surrounding the study's outcomes was carefully considered to contribute meaningfully to the existing body of knowledge.

Results

Visual Progress Display in ePortfolios: Enhancing Attention and Motivation

In the exploration of ePortfolio features within the context of English writing courses, a prominent theme emerged from interviews with six college students and two lecturers experienced in ePortfolio assessments. Central to their discussions was the positive influence of the visual progress display feature on attention and motivation. The visual progress display, a notable component of ePortfolios, was found to be instrumental in capturing students' attention. This feature, typically presented in the form of a timeline or graphical interface visually represents the development of students' writing skills over time. Each entry becomes a tangible marker of progress, creating a chronological narrative within the ePortfolio.

This visual element is intentionally designed to be conspicuous, ensuring that students readily notice and engage with it. By providing a snapshot of their growth, the visual progress display offers a tangible representation

of their evolving writing abilities. Leveraging the human inclination towards visual stimuli, this feature aims to make the learning process more tangible and rewarding. Insights from student perspectives were gathered through interviews, revealing a unanimous appreciation for the impact of visual progress displays. One student expressed, "The visual progress display is like a constant reminder of my improvement. It motivates me to invest more effort in my writing." Another student shared, "I often revisit my earlier works; it's satisfying to see how far I've come. It keeps me focused on the journey, not just the assignment."

Personalized Expression's Influence on Relevance and Motivation

In the students' discussions, the flexibility provided by ePortfolios in expressing themselves through diverse formats became a significant factor contributing to the relevance of writing tasks. ePortfolios, characterized by their adaptability, enable students to tailor their writing expressions to corresponds to their individual learning goals and interests. Unlike traditional assessments with rigid formats, ePortfolios offer a spectrum of options, such as multimedia integration, varied writing styles, and personalized elements. This flexibility aims to make writing tasks more relevant by allowing students to showcase their understanding in ways that resonate with their personal preferences and goals.

These results were drawn from students' firsthand experiences, with one participant stating, "I appreciate that I can include visuals, like infographics, in my ePortfolio. It makes the writing more relevant to my major, and I enjoy the creative aspect." Another student highlighted, "Being able to choose the format adds a personal touch. It's not just an assignment; it's a reflection of my interests and where I want to go." Moreover, student responses emphasized the importance of comprehensive assessment. One participant expressed, "Knowing that everything I've learned is part of the assessment makes the writing more relevant to the whole course. It's not just about one essay; it's about showcasing what I've gained throughout the semester."

Positive Reactions and Personal Achievements Boost Confidence

The ePortfolio platform allows for social interaction through comments or reactions. When students receive positive responses from peers, lecturers, or even other readers, it contributes significantly to their confidence. Knowing that their work is appreciated and acknowledged creates a positive reinforcement loop, encouraging students to persist in their writing efforts. One of the lecturers shared, "What's fascinating is how students talk about their writing now. It's not just about getting a good grade; it's about creating something they're proud to display. This shift in mindset is a clear sign of increased motivation."

Students also expressed how receiving positive comments or reactions from peers within the ePortfolio community contributes to their confidence. One student shared, "When my classmates comment or like my essays, it feels great. It's like a small victory. It makes me believe that my writing matters and that I'm on the right track."

Enhanced Satisfaction Through Ownership and Intrinsic Motivation

During the informal interviews, students frequently underscored the intrinsically motivating aspect of creating and curating their ePortfolios. For instance, one student vividly expressed, "When I see my ePortfolio, I feel proud of what I've accomplished. It's not just about getting a grade; it's about seeing how far I've come as a writer." The concept of satisfaction, as illuminated by the students, extends beyond the conventional understanding of academic contentment. It is deeply intertwined with the celebration of personal achievements and growth. One lecturer emphasized:

> I observe that the majority of students take initiative in completing their ePortfolios after each session. Some even add new essays without the need for teacher prompting. I can see some of them invest a lot of time and effort in adding new posts and refining old ones to perfection according to their ideas. Even after I have compiled the ePortfolio grades, I still see them posting new articles.

It further illustrates the strong connection between using ePortfolios and students' intrinsic motivation to enhance their writing skills.

The students' ongoing commitment to updating and refining their ePortfolios post-assessment suggests that the ePortfolio, for them, is not merely a task to be completed for a grade but an ongoing project reflecting their evolving identity as writers. This aligns with the previously discussed theme of ownership and intrinsic motivation, emphasizing that students find value in continuing to build and perfect their digital writing portfolios beyond the formal evaluation period. This sustained engagement underscores the ePortfolio's role as a dynamic tool that extends beyond traditional assessment boundaries, fostering an enduring motivation for self-improvement and expression.

Discussion

The integration of ePortfolios into English essay writing courses has proven to be a transformative strategy, significantly impacting student motivation.

ePortfolios effectively capture students' attention using visual progress displays. This feature serves as a dynamic and engaging representation of students' writing journey, creating a chronological narrative of their progress. By leveraging visual elements, ePortfolios provide a constant reminder of improvement, motivating students to invest more effort in their writing.

Moreover, the flexibility of ePortfolios allows students to express themselves in varied ways, enhancing the relevance of writing tasks to individual learning goals and interests. This personalized expression not only connects writing activities to course material but also makes the learning experience more meaningful. The ability of ePortfolios to align writing tasks with individual interests and goals resonates with the literature, which emphasizes the importance of relevance in maintaining student engagement.

ePortfolios contribute significantly to building students' confidence in their writing abilities. Beyond providing immediate feedback, the social aspect of ePortfolios, where students can receive positive reactions and comments from peers and instructors, plays a pivotal role. Positive reactions, such as comments or "likes," create a sense of accomplishment and reinforce the idea that writing is a valued skill. This collaborative and supportive environment aligns with the literature on the role of peer recognition in fostering motivation (Johnson, 2018).

The sense of ownership cultivated through ePortfolios enhances student satisfaction in the writing process. Students perceive their writing as a representation of themselves, creating a personal investment in their work. This intrinsic motivation, derived from personal reflections and the celebration of achievements within the ePortfolio, contributes significantly to overall satisfaction. This sentiment echoes the literature's emphasis on intrinsic motivation, where the joy of an activity becomes a reward (Deci et al., 1991). The ePortfolio, functioning as a canvas for personal reflections and a showcase of accomplishments, becomes a source of pride and fulfillment for students. This is supported by the psychological needs outlined in the self-determination theory (Deci & Ryan, 2000), where competence, autonomy, and relatedness are pivotal for fostering intrinsic motivation. Moreover, the ePortfolio's role in showcasing the developmental journey of each student resonates with Schön's (1983) notion of reflective practice. The iterative process of self-reflection and refinement, integral to ePortfolio creation, contributes to the deepening of students' understanding of their evolving writing abilities.

The findings of this paper align with existing literature, reinforcing the positive impact of ePortfolios on student motivation. Visual elements, personalized expression, confidence-building interactions, and the cultivation of a sense of ownership resonate with motivational theories discussed in the literature review. ePortfolios are positioned as a versatile tool that enhances established principles of motivation in education. While the current project highlights the benefits of ePortfolios in a specific context, it is essential to acknowledge potential variations across different teaching contexts. The contextual nature of educational interventions suggests that the effectiveness of ePortfolios may be influenced by factors such as institutional culture, student demographics, and course design. This recognition contributes to a broader understanding of how ePortfolios impact motivation, allowing for nuanced variations in different educational settings.

However, it is necessary to acknowledge certain limitations that may influence the generalizability and scope of the findings. Engaging a limited number of participants, including six college students and two lecturers, the small sample size may not fully capture the diversity of perspectives or account for individual variations in motivation. While the insights from participants are valuable, the study recognizes the need for larger and more diverse samples to enhance the robustness and generalizability of the findings. Furthermore, ethical constraints posed challenges in conducting informal interviews with our own students, limiting direct insights from the immediate educational context. While alternative strategies were employed to gather valuable insights, the absence of direct interactions introduces a potential limitation in understanding the nuances of the local educational environment. Finally, temporal dynamics also come into play, as the study captures a specific moment in time. The dynamics of student motivation may evolve over an extended period, and the temporal limitations suggest that future research could adopt longitudinal approaches to track changes in motivation over time.

Conclusion

In examining the role of ePortfolios in English essay writing, this study reveals several insights into their impact on student motivation. The key themes of attention, relevance, confidence, and satisfaction emerged, shedding light on how these digital tools influence student engagement. The visual progress display feature of ePortfolios stands out as a significant factor in capturing and sustaining students' attention. Representing the evolution of their writing skills over time, this visual element serves as a constant reminder of progress. Students appreciate this feature, finding motivation in observing their improvement.

The relevance of ePortfolios is highlighted by the flexibility they offer for personalized expression.

Students feel a connection between the content and structure of ePortfolios and their learning goals. The ability to curate their writing journey contributes to a sense of relevance and purpose in their academic efforts. Besides, ePortfolio assessment positively impacts student confidence, not just through immediate feedback but also through social interaction. Positive reactions, such as comments or likes, contribute significantly to students' confidence. Peer recognition and support create a positive feedback loop, reinforcing the importance of their writing efforts. The theme of satisfaction is also closely tied to the sense of ownership that students experience. Viewing their writing as a representation of themselves within the ePortfolio platform adds a layer of personal investment, contributing to increased satisfaction. The process of creating and curating ePortfolios becomes intrinsically motivating for students.

This study aligns with the ARCS model, a theoretical framework that emphasizes attention, relevance, confidence, and satisfaction as key components of motivation. The findings contribute to the existing literature on motivation in education, showcasing the consistent applicability of the ARCS model across different educational contexts. However, it is essential to acknowledge the limitations of this study, including its contextual specificity, small sample size, and potential researcher bias. Ethical considerations also warrant caution in interpreting the findings.

Teachers may facilitate social interaction within the ePortfolio platform by creating opportunities for students to comment on and react to each other's work to foster a supportive community, significantly contributing to students' confidence and motivation. Establishing mechanisms for acknowledging and celebrating achievements through comments and reactions is recommended. This communal aspect echoes the relatedness component of the self-determination theory , which posits that a sense of belonging and connection enhances intrinsic motivation. Furthermore, educators should guide students to view ePortfolios as tools for personal expression and reflection. The process of self-reflection and the celebration of personal accomplishments contribute to a deeper understanding of students' evolving writing abilities. Lastly, providing timely and positive feedback is crucial. Teachers should actively engage with students' submissions, offering constructive comments and reactions. Training programs for educators could incorporate strategies for delivering effective and encouraging feedback, recognizing its impact on students' confidence and motivation.

Moving beyond immediate practical applications, there are key areas for further research that can contribute to a more nuanced understanding of the relationship between ePortfolio assessments and student motivation. Longitudinal studies are essential to explore the sustained impact of ePortfolio use on student motivation. Tracking students' motivation and writing performance over an extended period can provide insights into the long-term effectiveness of this innovative assessment approach. This would help in understanding how motivation evolves and is sustained over time as students engage with ePortfolios throughout their academic journey. Moreover, researchers should consider examining cross-cultural contexts to determine whether the findings hold across diverse cultural backgrounds and educational settings. Investigating the universality of ePortfolios in enhancing motivation for English essay writing can contribute to more inclusive and globally applicable pedagogical strategies. Conducting comparative analyses between ePortfolio assessments and other innovative assessment methods is another avenue for research. Understanding how ePortfolios fare against alternative approaches can inform educators' decisions about the most effective strategies for promoting motivation in English writing courses. This could involve exploring the comparative impact on motivation, engagement, and learning outcomes.

In conclusion, this research underscores the potential of ePortfolio assessments as tools for enhancing student motivation in English essay writing. By understanding the nuanced ways in which these digital platforms impact attention, relevance, confidence, and satisfaction, educators can leverage technology to actively involve students in their academic journey.

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Appendix A
Translated Questions in Interviews With Students and Lecturers

Table A1
Questions for Students

Aspects	Questions
Attention	What do you find interesting in ePortfolio assessments?
	Any specific parts that really keep you focused?
Relevance	How do ePortfolio assessments connect with what you want to learn?
	Does what you put in your ePortfolios relate to your courses?
Confidence	How confident do you feel doing tasks through ePortfolios?
	Are there any experiences that made you feel more confident in your writing?
Satisfaction	What parts of ePortfolio assessments do you enjoy in your learning experience?
	Is there anything that makes using ePortfolios for writing tasks more fun for you?

Table A2
Questions for Lecturers

Aspects	Questions
Attention	How do you perceive the attention-grabbing elements in ePortfolio assessments, particularly concerning students' initial interest in writing tasks?
	Have you noticed any strategies or features within ePortfolios that effectively capture students' attention in the writing process?
Relevance	In what ways do you find ePortfolio assessments relevant to students' learning goals in writing?
	From your observations, how do the content and structure of ePortfolios align with students' understanding of the course material, making it personally meaningful?
Confidence	Reflecting on your experiences, how does the use of ePortfolios impact students' confidence in completing writing tasks?
	Can you share instances where students' confidence in their writing abilities has been positively influenced by the ePortfolio assessment approach?
Satisfaction	What aspects of the ePortfolio assessment process contribute to students' overall satisfaction with the learning experience in writing?
	From your perspective, are there specific elements within ePortfolios that enhance students' satisfaction derived from completing writing tasks?

Appendix B
Codes and Themes Related to ePortfolio Use and Student Motivation in English Writing

Raw data (excerpts)	Codes	Sub-themes	Themes (ARCS model)
"The visual progress display is like a constant reminder of my improvement. It motivates me to invest more effort in my writing." (Student 2)	Awareness of progress; Increased effort	Visual progress display	Attention
"I often revisit my earlier works; it's satisfying to see how far I've come." (Student 4)	Reflection on past work; Perceived improvement	Reflection on past work	Attention
"Students become more aware of their development when they can visually see their writing progress over time." (Lecturer 1)	Visibility of progress; Sustained attention	Visual progress display	Attention
"I appreciate that I can include visuals, like infographics, in my ePortfolio. It makes the writing more relevant to my major." (Student 1)	Multimedia use; Task relevance	Task relevance	Relevance
"Being able to choose the format adds a personal touch. It's not just an assignment." (Student 5)	Choice of format; Personal relevance	Personalized expression	Relevance
"Knowing that everything I've learned is part of the assessment makes the writing more relevant to the whole course." (Student 3)	Comprehensive assessment; Course-wide relevance	Task relevance	Relevance
"When my classmates comment or like my essays, it feels great. It makes me believe that my writing matters." (Student 6)	Peer recognition; Confidence building	Confidence built through positive reactions and achievement	Confidence
"Positive reactions encourage students to keep writing and sharing their work." (Lecturer 2)	Social feedback; Persistence	Confidence built through positive reactions	Confidence
"It's not just about getting a good grade; it's about creating something they're proud to display." (Lecturer 1)	Pride in work; Shift in motivation	Confidence built through achievement	Confidence
"When I see my ePortfolio, I feel proud of what I've accomplished." (Student 2)	Sense of achievement; Ownership	Satisfaction through ownership	Satisfaction
"Even after grades were finalized, some students continued adding and refining their portfolios." (Lecturer 2)	Voluntary engagement; Intrinsic motivation	Intrinsic motivation	Satisfaction
"It's about seeing how far I've come as a writer, not just finishing assignments." (Student 4)	Writer identity; Personal growth	Satisfaction through intrinsic motivation	Satisfaction

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Guided Reflection, Greater Readiness: Enhancing Student Engagement and Career Readiness Through Curricular ePortfolio Integration

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As demands rise for graduates to demonstrate workplace-ready competencies, academic programs are turning to ePortfolios as tools to bridge the gap between classroom learning and career preparation. This case study analysis investigates how the integration of ePortfolios into the curriculum influences student engagement and career readiness across three internship programs. Using a descriptive case study design, the research analyzes pre- and post-test data from 608 students who self-assessed 10 core career competencies, including Communication, Technology, and Leadership. Programs that embedded ePortfolio development within their curriculum saw significantly higher ePortfolio development rates and greater student gains in perceived career readiness compared to those where students were expected to create portfolios independently. Descriptive statistics revealed consistent improvements across key competencies, with the strongest gains observed in programs offering structured guidance and curricular alignment. These findings suggest that curriculum-led ePortfolio initiatives not only foster deeper reflection and learning but also position students more confidently for post-graduation success. The study confirms the value of intentionally integrating ePortfolios into communication education

The transition from high school to college and, subsequently, to the workplace is a critical period that requires students to possess a wide range of skills to ensure their readiness for career success (Hora et al., 2018). However, there is a widespread and persistent assumption that graduating from college equates to being fully prepared for the demands of the professional world (Pandya et al., 2022). Many students leave college equipped with academic knowledge but lack the practical skills and competencies required to navigate the complexities of today's workforce (Whitney et al., 2021).

On the other hand, career readiness, which encompasses both hard and soft skills such as communication, problem-solving, leadership, and teamwork, is often insufficiently integrated into college curricula and is not consistently recognized as a core learning outcome across academic departments (Thornhill-Miller et al., 2023). As a result, many graduates struggle to translate their academic achievements into meaningful success in professional settings (Edmondson & Matthews, 2021). This underscores a pressing need for higher education to prioritize the development of workforce-ready competencies.

Given that Communication Studies programs in higher education emphasize essential soft skills, such as communication, collaboration, and critical thinking, within their curriculum (Morreale & Pearson, 2008), educators in the field are well-positioned to leverage ePortfolios as a powerful pedagogical tool. ePortfolio development offers students a structured opportunity to reflect on and demonstrate their competencies, transforming their academic experiences into compelling professional narratives (Eynon & Gambino, 2017). Within the context of Communication Studies, this process not only enhances students' self-awareness and career readiness but also increases their ability to pursue and attain meaningful professional opportunities.

Using a descriptive case study methodology, this study examined how integrating ePortfolios as a structured component of the curriculum influenced students' perceived career readiness. Research analyzed three distinct internship programs to explore the effectiveness of ePortfolio guidance in enhancing student portfolio creation and its impact on their confidence in career readiness. Each case represents a unique context for ePortfolio implementation and curricular integration, enabling cross-program comparisons of impact. Drawing on descriptive statistics, the study used percentage score changes across career readiness and employability frameworks of pro-active attitude (Seibert et al., 2001) and self-regulation (Gaumer Erickson & Noonan, 2021); and the eight National Association of Colleges and Employers (NACE) aligned competencies which include communication, leadership, technology use, and critical thinking (see NACE, 2022) to understand the role of structured ePortfolio engagement in supporting student learning and career preparation.

This study examined three distinct programs representing diverse institutional contexts: a four-year Hispanic-Serving institution (HSI) offering a Communication Studies internship program, a grant-funded STEM program at a Predominantly Black Institution (PBI) community college, and a nationally supported internship initiative serving students from Historically Black Colleges and Universities (HBCUs). Across these varied educational environments, students participated in both structured and unstructured ePortfolio development using Bravofolio, an ePortfolio and career-readiness ecosystem that helps students turn coursework, projects, internships, and reflections into

evidence of competency, and receive scored feedback via a NACE-intelligence inspired rubric.

The findings from this comparative case analysis offer valuable insights into the potential of ePortfolios as a tool to bridge the gap between academic learning and career readiness (Sahin, 2009). The results underscore the importance of curricular integration and structured support in fostering both skill development and meaningful student engagement. Ultimately, this study aims to inform Communication Studies programs and higher education institutions on how to enhance career readiness by adopting intentional, curriculum-embedded ePortfolio practices that promote reflection, skill development, and professional identity formation.

Literature Review

The Changing Landscape of Career Readiness

The modern workforce expects graduates to possess career readiness skills beyond academic knowledge and technical expertise. However, the gap between these expectations and actual preparedness remains significant. According to Koehorst et al. (2021), there is a false assumption that graduates from high school and college are fully prepared for career success. Instead, many students lack key career competencies such as effective communication, teamwork, problem-solving, and operational skills, which are crucial for workplace success. Additionally, the responsibility of fostering these skills often falls outside the scope of academic curricula and is instead relegated to career centers or extracurricular activities (Reardon et al., 2015). This approach often leads to inconsistencies in career preparation, as it assumes that students will naturally develop these skills without formal guidance.

Research by Hora et al. (2018) emphasized the importance of integrating career readiness into the academic curriculum, thereby developing a more comprehensive approach to preparing students for life after graduation. The authors argued that while career centers provide resources, their reach is limited, and that career readiness must be more deeply integrated into coursework and classroom activities. Employers are emphasizing the need to engage graduates who possess 21st-century skills such as adaptability, cultural competency, and technology proficiency (Koehorst et al., 2021; van Laar et al., 2017). However, educational institutions are not fully aligned with these workforce expectations, resulting in a lack of systematic exposure to these essential competencies during the college experience (Edmondson & Matthews, 2021). This disconnection calls for innovative, integrative approaches that bridge academic learning with workplace application. The use of ePortfolios is promising in fostering and showcasing career readiness.

The Role of ePortfolios in Career Development

ePortfolios in higher education have been increasingly recognized as an effective tool for promoting career readiness, reflective learning, and documenting skills (Whitney et al., 2021). A digital collection of a student's academic and experiential work, ePortfolios showcase students' development over time and provide a platform for self-expression and career planning (Jenson & Treuer, 2014; Yancey, 2009). They bridge academic accomplishments and career development, enabling students to present a cohesive narrative of their skills, learning experiences, and goals; thus, improving self-efficacy, critical thinking, and metacognitive skills (Chen & Black, 2010).

ePortfolios enable students to engage in reflective practice, allowing them to critically analyze their learning experiences and career aspirations (Eynon & Gambino, 2017). Integrating various career readiness competencies into a single, organized digital space makes it easier for students and faculty to assess progress and areas for improvement. According to Bryant and Chittum (2013), ePortfolios support holistic learning as students can link academic coursework with professional development and make connections between their educational experiences and future career paths. When implemented effectively, ePortfolios also help students build a professional digital presence, a prudent aspect of modern career development.

While much of the early research on ePortfolio use is generally positive, Bryant and Chittum's (2013) critical review of the literature revealed a significant lack of empirical evidence supporting its effectiveness. They argued that much of the research is anecdotal, speculative, or methodologically weak, making it difficult to draw definitive conclusions about ePortfolios' impact on student learning or career readiness. In contrast, Yancey (2009) highlighted the importance of intentional implementation, noting that the successful adoption of ePortfolios depends on structured support and integration within the curriculum. Jenson and Treuer (2014) echoed this perspective, emphasizing the need for faculty training and institutional support to help students engage meaningfully with ePortfolio development. Without a clear framework and purposeful instructional design, students may not fully benefit from ePortfolio practices, limiting their potential as tools for reflection, skill development, and professional growth.

These insights collectively suggest that while ePortfolios hold considerable promise, their impact is contingent upon thoughtful integration and support. This leads to a broader issue: despite the growing attention ePortfolios receive in higher education, notable gaps remain in the research, particularly around how these tools can be embedded in curricula and better aligned with career readiness outcomes.

Missing Links Between Practice and Impact

Consequently, gaps may remain in how these tools are integrated within the academic curriculum, as current research indicates a limited focus on directly incorporating career competencies into coursework and structured learning activities (Finley & McNair, 2013). Hora et al. (2018) also suggested that career readiness initiatives are often viewed as supplementary activities within educational institutions. For instance, a study by Xing et al. (2019) found that while students participated in various college and career preparation activities, these were often optional and lacked integration into the standard curriculum, suggesting a need for more structured approaches to prepare students for post-secondary transitions effectively. Thus, despite the recognized importance of career readiness, a disconnect remains between educational programs and workforce expectations, with many institutions offering career development as separate initiatives rather than integrating them into the academic experience (Green et al., 2021).

Eynon and Gambino (2017) further suggested that ePortfolios are often implemented without the necessary training and support, resulting in inconsistent use and reduced student engagement. Using a standardized approach to assess career readiness within ePortfolios could provide more measurable outcomes and facilitate a clearer understanding of how students develop these skills throughout their academic journey (Cordie et al., 2019). Therefore, there is a need to align ePortfolio tools with recognized frameworks for career readiness, such as NACE (2024) competencies.

In summary, despite the growing emphasis on career readiness and the use of ePortfolios in higher education, research continues to reveal a lack of clarity on how to engage students in the use of these tools and how they can be effectively embedded into academic curricula to produce measurable outcomes (Lilly & Cooper, 2021). Many studies have highlighted the benefits of ePortfolios, yet few offer comparative analyses across diverse academic contexts or focus on the importance of structured curricular integration. Moreover, limited research has addressed how ePortfolios support the development of career readiness self-awareness when guided by faculty and supported by institutional frameworks. This gap underscores the need for research that not only evaluates the effectiveness of ePortfolios as assessment tools but also examines how incorporating structured support and curricular alignment influences students' success (see Kolade & Owoseni, 2022; McNair et al., 2017).

To address these gaps, this study employed a comparative multiple case study approach to explore the implementation of ePortfolios in structured and unstructured portfolio development. Each case provides a unique context for examining how ePortfolios were used within varying curricular structures, allowing for an analysis of their impact on student outcomes. The study also leveraged the Bravofolio platform to capture real-time data on student artifact reflection, skill development, and platform engagement. Based on this review, the study addressed the following research questions:

- RQ1: How does integrating ePortfolios into the academic curriculum affect students' career readiness?
- RQ2: How does structured support and training impact ePortfolio use and student engagement?

Methodology

Research Design and Approach

Case studies are often used as a methodology to explore issues when little theory is available, to describe processes and effects of an event or intervention, and to explain complex phenomena (Kohn, 1997). A case study is ideal for exploring real-world, contextual, or programmatic issues, making it an excellent fit for studies on career readiness, ePortfolio integration, and curriculum development. A case study methodology was chosen for this study due to its ability to offer nuanced comparisons for a deeper understanding of how program context, instructional approach, and structured support influence student engagement and outcomes (Hanson & Algozzine, 2016; Keutel et al., 2014).

This study employed what Hanson and Algozzine referred to as a "richly descriptive" (2016, p. 16) multiple case study design (Stake, 2006), which used Yin's (2003) conception of replication logic in exploring how embedded ePortfolios in academic curricula impact students' perceived career readiness across three distinct internship programs. Creswell and Creswell (2017) explained that case study research involves the study of an issue explored through one or more cases within a bounded system (i.e., a setting, a context), and they are particularly useful when researchers want to explore programs, events, or activities in depth, typically over a sustained period. The authors noted that data collection in case studies often involves multiple sources of information (e.g., interviews, documents, observations), which supports triangulation and enhances the depth of understanding. Creswell and Poth (2018) identified three kinds of case studies (i.e., intrinsic, instrumental, and collective) that can be effective in program evaluation and education-related research where a real-world context is essential.

This case study design reflects characteristics of both instrumental and collective approaches. It is instrumental in that the individual cases are examined to shed light on a broader issue—namely, fostering career readiness within programs where students are expected to develop key competencies (i.e., oral communication, critical thinking, collaboration, and media literacy). At the same time, it is collective because it involves

Table 1
Sample Career Readiness Assessment Questions

NACE readiness competency	Components	Example
Proactive Attitude	Goal setting, taking risks for improvement, and seeking opportunities for growth.	1. I always complete my projects before the deadline.
Self-Regulation	Time management, attention to detail, and self-discipline.	52. I pay attention to detail, resulting in few, if any, errors in my work.
Work Ethic/Professionalism	Dependability in performance, taking responsibility, and upholding workplace values.	4. I am always prepared to do what needs to be done.
Communication	Writing professionally, giving oral presentations, and summarizing complex information.	5. I can successfully write and edit memos and letters, and other technical documents.
Teamwork	Collaborating with others, conflict resolution, and delegating tasks.	25. I can build strong, positive working relationships with coworkers.
Equity & Inclusion	Cultural awareness, advocating for others, and inclusive decision-making.	56. I advocate for inclusion, equitable practices, justice, and empowerment for historically marginalized communities.
Critical Thinking	Evidence-based reasoning, problem scoping, and anticipating consequences.	27. To fully understand a problem, I gather and analyze information from multiple sources.
Research	Collecting and organizing data, documenting sources, and translating findings.	19. I can make numbers understandable to an audience.
Technology	Proficiency with tools, adapting to new technologies, and data management.	30. I have advanced knowledge of Word, Excel, PPT, and PDF.
Leadership	Inspiring others, strategic planning, and mentoring.	60. I often inspire others by encouraging them and building mutual trust.

analyzing multiple cases to identify patterns, differences, and similarities across diverse educational contexts.

Each case represents a unique educational environment and approach to ePortfolio integration, allowing for a comparative exploration of similarities and differences across programs (based on Stake, 2006). Quantitative data in the form of pre- and post-test assessment measures were used to assess changes in students' self-perceived competencies (see Table 1). Interpretive insights from student reflections, ePortfolio artifacts, and usage patterns within the Bravofolio platform then supplemented these data. Descriptive statistics (calculated using percentage scores) were used to examine changes in the 10 career readiness competencies. This analytic strategy supported within-case analysis (patterns within each program) and cross-case comparison (how different structural and curricular approaches influenced outcomes).

Participants and Program Contexts

Participants ($n = 608$) were drawn from three internship programs to represent a range of institutional types, student populations, and curricular approaches to career readiness. The diversity of these programs enhanced the transferability of findings and offered insight into how programmatic structure shapes ePortfolio success.

Case 1: Four-Year University Communication Internship Program

This credit-bearing internship course was offered at a mid-sized, four-year public teaching institution. It was specifically designed for undergraduate Communication Studies majors who were either currently enrolled in an internship or preparing to begin one in the following semester. The course served as a professional development bridge, helping students connect classroom knowledge to workplace expectations. Through a structured curriculum that emphasized reflective practice, goal-setting, and career planning, students explored themes such as professional communication, organizational culture, and ethical leadership. ePortfolio development was fully integrated into the course design, with students using Bravofolio to articulate their academic and experiential learning, craft professional bios, and develop digital artifacts showcasing their

readiness for the workforce. Weekly discussions, peer feedback, and instructor-guided assignments helped students refine their career narratives and document key competencies such as communication, critical thinking, and teamwork (see Table 2).

*Case 2: Two-Year Community College STEM Grant Program (***n** *= 9)*

This program was part of a STEM pathways initiative at a community college, funded through a national grant aimed at increasing access to high-demand technical careers. Designed to support students traditionally underrepresented in STEM fields, the program provided intensive, hands-on training through a series of STEM boot camps, where students engaged in applied learning experiences in areas such as coding, robotics, data analysis, and engineering design. The curriculum emphasized scientific inquiry, technical skill development, and collaborative problem-solving to prepare students for internships, undergraduate research opportunities, or direct entry into STEM careers.

Table 2
Case 1: Guided ePortfolio Assignment Prompt

Section	Content
Assignment title	e-Portfolio Final Assignment
Assignment objective	Provide an opportunity to construct an ePortfolio to showcase career readiness to potential employers.
Platform	Use Bravofolio (https://bravofolio.com) to construct the ePortfolio.
Required artifacts	Include at least nine (9) examples or artifacts in the portfolio. Artifacts may map to multiple skills.
Acceptable artifact types	• Résumé • Sample papers • A speech or performance; a performance script • Brochures, editorials, flyers, etc., you created • Certificates of achievement • Photos of you working on the job or in group work • Presentation slides (e.g., PowerPoint) used for a presentation/assignment • Excel files • Artwork • Video links of your work (YouTube/Vimeo) • Websites of organizations you have worked with or volunteered for • LinkedIn or other professional social media accounts • Clean photos with family/friends, or you engaged in a hobby
Career Readiness Skills to Demonstrate	• Career & Self-Development • Written Communication • Oral Communication • Teamwork • Equity & Inclusion • Technology • Leadership • Critical Thinking • Professionalism
Grading criteria	You will be graded on the extent to which the ePortfolio showcases each of the nine career readiness skills. Some artifacts may demonstrate multiple skills; however, a minimum of nine (9) total artifacts is still required.
Additional note	Use clear, professional formatting and ensure that all artifacts are your own work or are properly credited. Maintain professional tone and visuals suitable for employer review.

Case 3: National Internship STEM and Financial Literacy Program

This case involved a large-scale, grant-funded national internship program designed to prepare undergraduate students from Historically Black Colleges and Universities (HBCUs) for competitive placements in the STEM and financial services industries. The program partnered with major corporations to offer students real-world work experiences while simultaneously delivering targeted professional development. With a cohort of 308 participants, this initiative was the largest and most widely distributed of the three case studies. The program's curriculum emphasized technical skill development, financial literacy, and professional preparedness, with students participating in a series of interactive workshops, alumni-led panels, and mock interview sessions. These activities were designed to expose students to workplace expectations and industry standards while reinforcing core competencies such as communication, teamwork, and professionalism. Workshops on coding, data analysis, and business finance were paired with sessions focused on resume building, workplace etiquette, and navigating corporate environments.

Comparing the Cases

Despite their differences in institutional context, focus, and design, all three programs shared a foundational emphasis on career readiness through internship-based learning. Each case provided students with real-world exposure to professional environments, whether through internal internships, communication-focused internships, STEM-intensive boot camps, or corporate partnerships in the tech and financial sectors. These experiences served as a unifying thread across the study and underscored the value of internships as high-impact practices that facilitate the application of academic knowledge to career development.

However, the programs diverged significantly in their approach to structure, curriculum integration, and the type of competencies emphasized. Case 1 (University Internship Course) adopted a guided, course-embedded model, where ePortfolio use was fully integrated into a scaffolded curriculum. The program was intentionally designed to support reflective learning and the formation of digital professional identity. Through structured assignments, faculty mentoring, and consistent feedback loops, students in these cases engaged deeply with career readiness concepts, particularly in areas such as soft skills, including communication, leadership, and teamwork.

In contrast, Case 2 (STEM Community College Program) and Case 3 (National Internship Program for HBCU Students) both featured a more flexible structure, with career readiness activities situated outside of their formal coursework. While these programs still offered intensive instruction through STEM bootcamps, technical workshops, financial literacy training, and mock interviews, their design placed greater responsibility on students to self-direct their learning and reflection.

Bravofolio served as the common platform for documenting student learning, professional development, and career readiness growth for all three internship programs. Regardless of the program's instructional style or disciplinary focus, Bravofolio was made available to students to build comprehensive digital portfolios that captured their academic work, professional experiences, and reflections on skill development. In more structured programs, such as Case 1, Bravofolio was fully integrated into course requirements, culminating in portfolio presentations where students articulated their competencies and received formative feedback. In Cases 2 and 3, the platform was not embedded in formal coursework but still provided a space for students to upload technical projects, showcase lab work, and record experiential learning from extracurricular workshops. More importantly, students completed a standardized career readiness assessment measure embedded within the Bravofolio system, which allowed for consistent measurement of competency development across each institutional context. Thus, Bravofolio functioned as both a digital learning tool and a unifying assessment mechanism, offering a shared structure through which students could reflect on their growth and demonstrate readiness for the workforce.

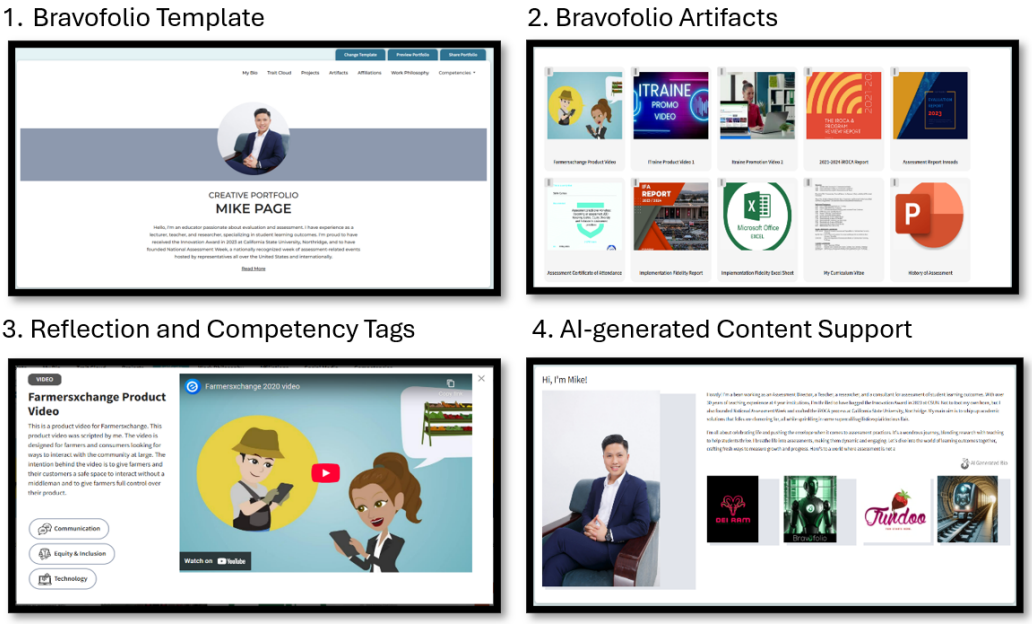
Overall, the comparison revealed that while all programs aimed to enhance students' career readiness through internship preparation, the degree of curricular guidance and the emphasis on soft versus technical skills played a significant role in shaping student outcomes.

Instruments and Data Collection

Data were collected using a pre- and post-career readiness inventory consisting of 60 statements aligned with the 10 career and employability competencies: Communication, Critical Thinking, Equity and Inclusion, Leadership, Proactive Attitude, Research, Self-Regulation, Teamwork, Technology, and Work Ethic/Professionalism. Participants completed the inventory at the beginning and end of their internship experience. Additionally, students participated in reflective activities through Bravofolio, which captured bio reviews, project artifacts, and written artifact descriptions, with records of AI-generated writing support (see Figure 1). These data provided additional insight into students' skill development and engagement levels.

Figure 1

Bravofolio Portfolio Interface (Demo Account): Landing Views for Sample User ("Mike Page")



Note. Students using a guided approach to ePortfolios developed these types of pages. Screenshots of the Bravofolio interface captured using a demo account. Copyright 2025 by MSSRA, LLC. Reprinted with permission. Embedded photo by Tran Nhu Tuan, Pexels (https://www.pexels.com/license).

Data Analysis and Interpretation

Descriptive statistics were calculated to determine average competency scores for each group before and after the intervention. Case analyses then identified which competencies improved most in each program and helped interpret the influence of specific curricular elements (e.g., guided reflection, faculty mentorship, project-based learning). Cross-case comparisons were then conducted to examine patterns across programs and identify which structural or instructional features contributed most to positive outcomes. Bravofolio's real-time analytics tracked student engagement and usage trends, which helped to triangulate the findings with behavioral indicators of participation and reflection (see Figure 2). By integrating descriptive statistics with contextual analysis, the study design provided a comprehensive picture of how ePortfolio engagement within varied academic environments influenced career readiness.

Results and Findings

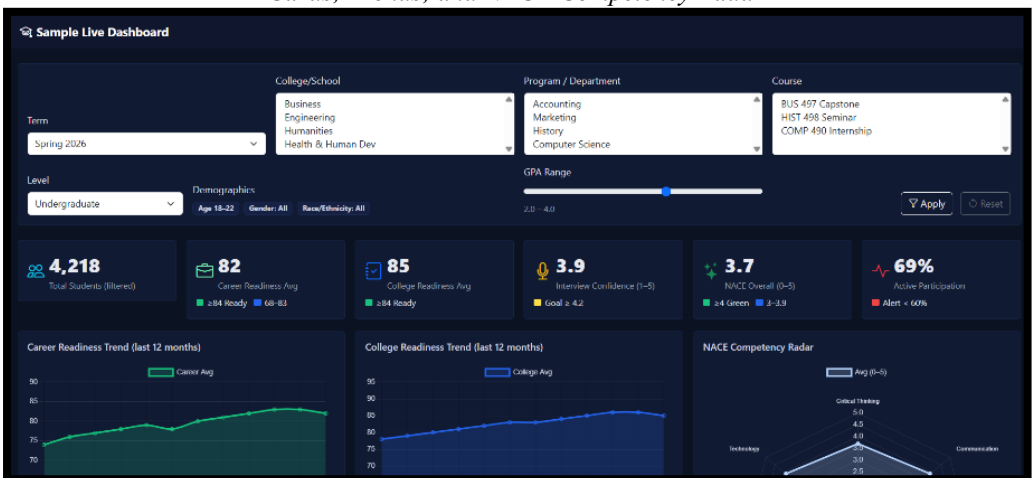
Through examining the three case studies, students demonstrated varying levels of competency, yet a clear pattern emerged linking program structure to student career readiness outcomes. Case 1, which administered both pre- and post-tests, yielded the strongest results, with measurable gains across all 10 competencies (see Table 3). In contrast, Cases 2 and 3 administered only post-tests, resulting in comparatively lower overall readiness scores. These findings underscore the value of an immediate curricular-integrated design in supporting well-rounded career preparedness.

Case 1: Four-Year University Communication Internship Program

Students in this structured, curriculum-embedded communication internship course demonstrated consistent improvement in every category, with an overall score increase from 86% to 89%. The most notable gains were seen in Self-Regulation (from 86% to 91%), Work Ethic/Professionalism (from 89% to 93%), and Diversity, Equity, and Inclusion (from 87% to 93%). The program's strong emphasis on reflective learning, faculty mentoring, and guided ePortfolio creation likely contributed to these results. Communication also improved from 80% to 86%, aligning with the program's disciplinary focus. The structured approach ensured that students received consistent opportunities to reflect on and document their skill development, leading to across-the-board growth in readiness.

Figure 2

Bravofolio Analytics Interface (Demo Data): Sample Live Dashboard With Term, Program, and Course Filters; KPI Cards; Trends; and NACE Competency Radar



Note. Screenshot of the Bravofolio interface captured using a demo account with synthetic data. No real student information is displayed. Copyright 2025 by MSSRA, LLC. Reprinted with permission.

Table 3

Career Readiness by Case

Category	Case 1 (n = 291) Pre M (%)	Case 1 (n = 291) Post M (%)	Case 2 (n = 9) Post M (%)	Case 3 (n = 308) Post M (%)
Pro-active attitude	87	90	81	84
Self-regulation	86	91	84	86
Work Ethic/professionalism	89	93	82	87
Communication	80	86	79	76
Teamwork	88	93	80	83
Diversity, equity, and inclusion	87	93	77	82
Critical thinking	87	92	80	83
Research	78	86	74	79
Technology	85	90	83	86
Leadership	87	90	84	81
Overall	86	89	81	83

Case 2: Two-Year Community College STEM Grant Program

Case 2 involved a small group of students in a grant-funded STEM pathway program at a community college. These students completed only a post-assessment, with no pre-test for comparison. Their average post-test score was 81% overall, with the highest competencies being Technology (83%), Leadership (84%), and Self-Regulation (84%). However, lower scores were observed in areas such as Research (74%), Communication (79%), and DEI (77%). The lack of structured reflection, mentoring, and guided integration of the ePortfolio into coursework may have limited the program's ability to foster higher self-assessed readiness in soft skills and critical thinking competencies. The strong scores in technical categories, such as Technology, reflect the emphasis on content in the bootcamps and workshops. In contrast, lower outcomes in communication and DEI suggest a need for more integrated development of soft skills within the curriculum.

Case 3: National Internship STEM and Financial Literacy Program

This national program, which served a large cohort of 308 students from HBCUs, also followed an

unstructured model, offering professional development, industry exposure, and real-world internships without formally embedding reflective or ePortfolio assignments into course-based structures. Students completed a post-test only, reporting an overall readiness score of 83%. Their strongest scores were in Technology (86%), Self-Regulation (86%), and Work Ethic/Professionalism (87%). Like Case 2, the emphasis on technical and professional workplace skills is reflected in these outcomes. However, categories such as Communication (76%), Leadership (81%), and DEI (82%) were comparatively lower, mirroring the trend seen in Case 2 and reinforcing the challenge of developing interpersonal and reflective competencies without structured curricular support.

Cross-Case Competency Comparison and Insights

When comparing the three cases, the structured approach yielded stronger, more balanced outcomes across both soft and technical skills. In contrast, the unstructured programs, despite emphasizing high-demand fields such as STEM and finance, reported lower career readiness in categories that relied on self-awareness, communication, and interpersonal reflection.

Case 1 stands out not only because of its structured design, but also because it included both pre- and post-assessments, allowing students to track and reflect on their growth. This intentionality resulted in post-test scores at or above 90% in 6 of the 10 competencies and improvements in all areas. In contrast, both Cases 2 and 3, though impactful in developing technical readiness, had lower post-test scores in Communication (79% and 76%, respectively), DEI (77% and 82%), and Research (74% and 79%), suggesting a gap in their perceived growth and development of soft skills that structured ePortfolio integration could help address.

Ultimately, this comparative analysis highlights the importance of implementing curriculum-guided, reflective ePortfolio implementation, particularly in fostering balanced career readiness that encompasses both technical expertise and transferable soft skills. For higher education programs, particularly those in Communication Studies, aiming to optimize student preparation for the workforce, this evidence suggests the need for intentional design, scaffolded support, and integrated assessment practices.

Recommendations

To fully realize the potential of ePortfolios in preparing students for professional success, institutions should prioritize the structured integration of ePortfolios into the academic curriculum. Treating the ePortfolio as a central instructional tool rather than an optional add-on ensures that students engage deeply with the reflective and developmental processes necessary for competency growth. Embedding ePortfolio assignments into internship courses, senior seminars, and capstone experiences allows students to curate a professional narrative that reflects both their academic and experiential learning.

Faculty development is also critical as instructors must be supported in learning how to effectively use ePortfolios to facilitate reflection, assess competencies, and provide meaningful feedback. Training sessions, collaborative workshops, and access to user-friendly digital platforms such as Bravofolio can empower faculty to guide students in articulating their strengths and identifying areas for growth.

Competency alignment remains another essential step. When ePortfolio tasks are directly mapped to established career and employability frameworks such as NACE competencies, students gain clarity in what they are expected to learn and how that learning connects to professional expectations. This alignment also helps programs to assess outcomes more systematically and communicate the value of their graduates to employers and stakeholders.

Finally, targeted support is necessary for underdeveloped competencies—particularly Self-Regulation and Proactive Attitude. Institutions should explore co-curricular strategies such as workshops on time management and goal-setting, mentorship opportunities, and the integration of AI-driven self-assessment tools following the pre-test assessment. These self-starting and self-management supports can help students build the internal habits required for lifelong learning and adaptability in a rapidly changing workforce.

Conclusion

This study examined two central questions: How does integrating ePortfolios into the academic curriculum affect students' career readiness? And how does structured support impact student engagement with the ePortfolio process? The findings from this multi-case analysis clearly demonstrate that structured, curriculum-guided ePortfolio use can contribute to broader and deeper competency development. Programs that implemented more reflective writing, ongoing mentoring, and aligned assessments, as demonstrated in the Communication Studies internship in Case 1, outperformed those that offered more flexible or informal approaches, as seen in Cases 2 and 3.

The implications for Communication Studies programs are especially promising, as Communication majors are uniquely positioned to benefit from ePortfolios, given their ongoing engagement with rhetorical, interpersonal, and critical thinking skills, as well as their designated career tracks. When used intentionally, ePortfolios can become powerful tools for these students to reflect on their experiences, demonstrate transferable

skills, and craft a compelling professional identity. However, the absence of structured guidance limits the effectiveness of these platforms and risks reducing the ePortfolio to a simple checklist exercise rather than a meaningful learning opportunity.

As a call to action, Communication Studies departments should take the lead in embedding ePortfolio practices into required coursework, internships, and senior-level projects. This ensures that students graduate not only with academic knowledge but also with a curated, digital representation of their learning journey—an asset increasingly valued by employers and graduate programs alike.

Looking forward, future research should examine the long-term effects of guided ePortfolio engagement, particularly its role in shaping students' employment outcomes, professional confidence, and lifelong learning behaviors. There is also a need to explore scalable strategies, such as peer mentorship and AI-based reflection tools, to support competencies like Self-Regulation and Proactive Attitude, as the work environment is rapidly changing and is more collaborative. As the landscape of higher education evolves, the field of Communication Studies is well-positioned to lead the way in modeling intentional, reflective, and career-aligned learning strategies that prepare students for success beyond graduation.

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Developing Teacher Identities Through ePortfolios: A Multimodal Approach

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Through a multimodal approach, we describe a qualitative case study that sought a deep understanding of how undergraduate teacher candidates constructed and communicated emerging teacher identities through ePortfolios in two undergraduate teacher preparation semester-long classes. Through the visual analysis of the candidates' ePortfolios and a thematic analysis of semi-structured interviews with eight focal participants, two important themes emerged. First, the candidates' developing teacher identities were illustrated through various modes of semiotic representations. These signs and symbols, or modes of semiotic representations, encompass multiple formats, such as quotations and stories, as well as multimodal forms, including self-portrait photography, teaching artifacts, images with special meanings, and strategic use of colors. Second, the findings demonstrate the candidates' design thinking through multimodal expressions. Implications are drawn to address opportunities and challenges for ePortfolio implementations, cultivating teacher candidates' active agency and their creative, multimodal expressions of developing identities through ePortfolios.

> I gave a little bit of a background of myself . . . why I went into teaching and how I cherish the times with my students, and I'm passionate about my education, future teaching. . . . I think that this ePortfolio really brought out the different aspects of why I want to teach and how I got into that. So, I think those messages are throughout my whole portfolio. . . . You kinda have to read through it to understand. (Teresa, Undergraduate Teacher Candidate, Elementary Education Major)

What happens when preservice teachers are provided with a digital space to creatively express themselves and how they are developing as professionals? The above statement by an undergraduate teacher candidate in their third year of an elementary (K–8) teacher preparation program foregrounds this study on preservice teachers' agency to communicate their emerging teacher identities through a multimodal approach in the ePortfolio assignment. In teacher preparation programs, electronic portfolios (ePortfolios) are utilized as an essential instrument to serve a variety of purposes: to collect data on teacher candidates' knowledge, skills, and dispositions for program evaluation and accreditation (Strudler & Wetzel, 2011), to document learning processes and professional growth (Gülbahar & Tinmaz, 2006), to demonstrate and promote reflection, self-assessment, and self-regulated learning (Chun-Burbank et al., 2023), and to increase employability (Cordie et al., 2019).

Despite the prevailing and multifaceted usage of ePortfolios in teacher education, tensions arise between two contrasting epistemological stances: (a) an objective philosophy that views ePortfolios as an assessment instrument to meet institutional requirements or accreditation purposes and (b) a subjective philosophy with a constructive nature that centers on the learners as they reflect and choose artifacts to document their professional trajectory (Strudler & Wetzel, 2011). Such contrasting viewpoints were illustrated in Hallman's (2007) interview study as conflicts developed in the process of composing ePortfolios when two prospective teachers engaged in an intensive negotiation of presenting themselves as professionals who mastered teaching practices (i.e., an objective philosophy) versus who were reflective and in constant inquiry for improvement (i.e., a subjective philosophy). The tensions illustrated in the above examples underscore the complex and dynamic nature of how teacher candidates portray themselves (i.e., self-identities) through representations found in ePortfolios.

In this qualitative case study (Yin, 2009), we sought to understand how ePortfolios were used to mediate undergraduate teacher candidates' emerging teacher identities and agency through a multimodal approach. Featuring the connection between identity development and the multimodal design of ePortfolios, this study is significant in three aspects. First, serving as a bridge between the aforementioned contrasting epistemological viewpoints, the ePortfolio project through a multimodal approach created a digital, mediated space, in which teacher candidates explored and experimented with different modes of semiotic representations (e.g., verbal and visual) to not only demonstrate their knowledge of the course content, but also to examine and reflect on their beliefs, visions, and to develop their "teacher persona" (Kincheloe, 2003, p. 47). Second, the emphasis on teacher candidates' agency and emerging identities through a multimodal approach attends to the call for a paradigm shift in teacher preparation from a skill-based, technicist stance, or factory model, that often views undergraduate teacher candidates as "a unit of production of an assembly line" (Kincheloe, 2004, p. 60) to incorporate a humanistic stance that centers on

these teacher candidates as a whole person (Darling-Hammond, 2009; Korthagen, 2016; Li, 2016). Third, this study can be applied in other disciplines. For example, students in fine arts, music, business, and engineering can showcase their emerging expertise and explore their emerging identities through multimodal design of an ePortfolio that not only reflects the discipline's distinctive nature but also highlights their individual characteristics as a professional in the field.

Teacher Identities Through ePortfolios

Research on teacher identity and ePortfolios in teacher education often focuses on students' perception and their reflective process. For example, in a post-degree teacher preparation program in Canada, Fu et al. (2022) investigated how 12 teacher candidates' perceptions about assessment were transformed because of their experiences with ePortfolios, such as peer assessment via ePortfolio reviews and choices in constructing ePortfolios. Fu et al. (2022) also noted that ePortfolios enable the candidates to make connections between their personal and professional aspects of life as it was emphasized by one teacher candidate in their research: "[the ePortfolio] does allow for you to show yourself as a whole person instead of just specific assignments" (p. 11). Although this brought forward the dynamic feature of teacher identities through ePortfolios, the results were solely drawn from the candidates' perceptions while their ePortfolios were not examined to reflect such features.

In another research study that featured a teacher education program at the University of Konstanz, Germany, ePortfolios were utilized to promote the notion of life-long learning, for which student teachers documented both formal and informal learning through reflective writing tasks during student internships (Ziegelbauer & D'Errico, 2021). In these reflective writing tasks, the teacher candidates formed a "digital career identity" through their ePortfolios (Ziegelbauer & D'Errico, 2021, p. 223). The authors argued for the connection between the teacher candidates' "digital career identity" through the ePortfolios with their efficacy to promote themselves in the teaching job market. However, the connection was rarely explained, and more importantly the teacher candidates' ePortfolios were displayed but not examined. While these two studies emphasized teacher candidates' perceptions and identity constructions, they failed to unpack the ePortfolios, especially about how those identities were constructed and represented throughout the ePortfolios. More importantly, they overlooked the multimodal and digital nature of representation in the digital space of ePortfolios.

ePortfolios and the *E*

In teacher education research, many studies on the digital aspect of ePortfolios analyze teacher candidates' perceptions about technology. For example, Roberts et al. (2016) discussed preservice teachers' resistance to the technology program, PebblePad, an ePortfolio platform in the research, due to their unfamiliarity with the program and preference for paper documentation. Similarly, Oakley et al. (2014) examined preservice teachers' experiences with Wikispaces, an information and communications technology (ICT) employed as an ePortfolio reflection platform. The findings of Oakley et al. (2014) revealed a contradictory phenomenon. That is, although the candidates rated themselves with high confidence in using ICTs, many simply uploaded their reflections as Word or PDF files, instead of utilizing Wikispaces' multimedia features, such as hyperlinks. While both Roberts et al. and Oakley et al. raised issues about teachers' knowledge of ePortfolio technology, Koehler et al. (2017) discussed the nature and quality of teachers' technological knowledge of ePortfolios. In the research of Koehler et al., they reviewed 589 ePortfolios and identified Technological Pedagogical and Content Knowledge (TPACK) as a suitable framework for understanding teachers' technological knowledge. Among these ePortfolios, teacher candidates employed various artifact technology, such as Web and social media, which corresponded to different levels of TPACK measures. While all these studies addressed the digital aspect of ePortfolios, they failed to examine the multimodal design thinking within the digital space via the ePortfolio technology.

The studies mentioned above failed to deeply examine the digital aspect of ePortfolios, especially regarding teachers' creativity and design thinking with multiple forms of media (Brown et al., 2015) and the connections across various forms of knowledge (Rowley & Munday, 2018). To address the above gaps, especially the lack of research on examining ePortfolios' multimodal design and its connection to how candidates represent their identity development, in this study, we emphasize the notion of the *e* (McDermott-Dalton, 2021) and employ a multimodal approach to understand how preservice teacher candidates expressed their emerging teacher identities through the multimodal design of their ePortfolios. Specifically, this study is guided by the following research questions:

1. How did undergraduate teacher candidates demonstrate emerging teacher identities through multimodal expressions of their ePortfolios?
2. How did undergraduate teacher candidates engage in multimodal design thinking to create their ePortfolios?

Theoretical Framework

Teacher Identities

This study is theoretically framed by two perspectives: teacher identity development and the use of multimodal design. The notion of teacher identities is complex and often explained under vastly different definitions. When reviewing different definitions about teacher identities, several commonalities can be identified. First, teacher identities are often formed through a continuously shifting and dynamic process, which responds to the questions "who am I at this moment" and "who do I want to become" (Beijaard et al., 2004, p. 122; Mockler, 2011; Smetana & Kushki, 2023). Second, a common feature is that teacher identities are often mediated and contextualized by a constellation of both internal and external factors (Goodson & Cole, 1994; Mockler, 2011). In other words, teacher identities often include "sub-identities" that align with "teachers' different context and relationships" (Beijaard et al., 2004, p. 122). A third important commonality is that teacher identities involve active agency in the process of identity-construction (Beijaard et al., 2004). Coldron and Smith (1999) explained that teachers draw on various traditions and practices in their identity construction: "People find a kind of agency in positioning themselves within this plurality of related resources in response to needs that arise from an assessment of the circumstances in which they find themselves" (p. 714). Fourth, teacher identities are represented and shaped through narratives of various communication modes (e.g., verbal and visual), which include teachers' internal, reflexive self-dialogue and are instantiated externally as stories told by teachers (Anspal et al., 2012; Mockler, 2011; Torres & McKinley, 2023). In this study, we consider the above four features and investigate how these fluid attributes of teacher identities are represented in teacher candidates' digital, multimodal expressions through their ePortfolios.

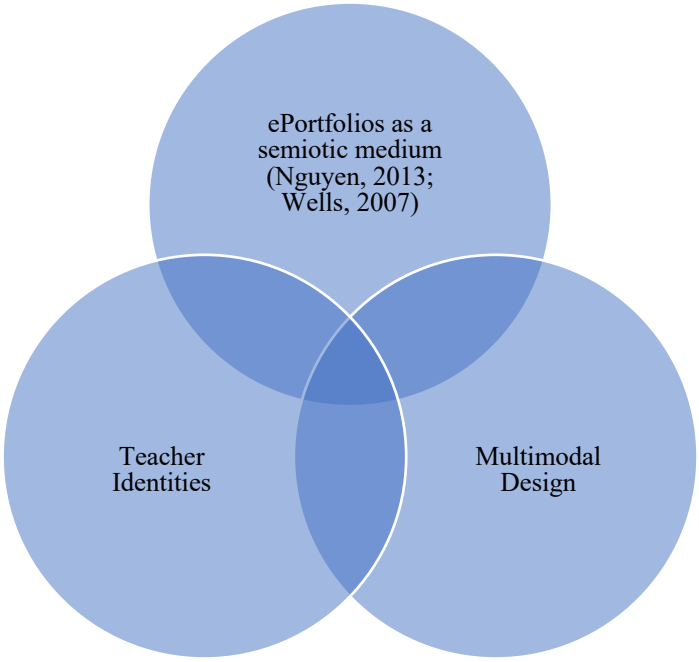
Designing ePortfolios Through a Multimodal Approach

The other component in the theoretical framework, multimodality, is closely associated with ePortfolio design. Multimodality indicates that meanings are formed and communicated through multiple representations (i.e., modes) beyond the use of traditional or textual language. Examples of modes include "image, gaze, gesture, movement, music, speech, and sound-effect" (Jewitt & Kress, 2003, p. 1), and color (Kress & Van Leeuwen, 2002). An important facet about modes is that no mode can carry a whole and complete message on its own (Jewitt & Kress, 2003). In many human interactions, meanings are often communicated via more than one mode. However, verbal texts in writing are traditionally given higher status in meaning-making, especially for academic performance. For example, in a traditional paper-based portfolio, written texts, such as academic essay writing, are often given more focus than other modes of meaning-making. Yet, written texts deliver partial messages, just like other modes of communication. In this study, we argue that, through a multimodal approach, incorporating different modes together can enrich meanings and convey significant messages about preservice teachers' emerging professional identities. In other words, through multimodal expressions in the digital space of ePortfolios, "word and image, verbal texts, 'visual culture' and 'print culture' are all dialogic relationships rather than binary opposites" (Hocks, 2003, p. 631) to one another.

Among all aspects of multimodal expressions, design thinking is considered an important aspect, which refers to "an analytic and creative process that engages a person in opportunities to experiment, create, and prototype models, gather feedback, and redesign" (Razzouk & Shute, 2012, p. 330). Design thinking in multimodality points to "the use of different modes – image, writing, colour, layout – to present, to realize, at times to (re-)contextualize social positions and relations, as well as knowledge in specific arrangements for a specific audience" (Kress, 2010, p. 139). Research on design thinking is mostly conducted in the fields of arts, engineering, science, and business management, yet it has a great potential in educational applications for its emphasis on creative and problem-solving skills (Carlgren et al., 2016; Razzouk & Shute, 2012).

The interaction between the above two theoretical perspectives, ePortfolios' multimodal design and teacher identity development, plays a significant role in this study. As illustrated in Figure 1, the ePortfolios serve as an essential instrument in the interconnected relationships between teacher identity development and multimodal design. As a semiotic medium (Nguyen, 2013; G. Wells, 2007) that carries multiple modes of meaning-making, the ePortfolios make identity development visible by providing a digital space for preservice teacher candidates to exercise their agency and multimodal design thinking, and more importantly to creatively express their emerging teacher identities, which are socially constructed through ongoing, situated activities that change across time and place (Beijaard et al., 2004) and influenced by a variety of experiences (Noonan, 2019). This layered approach affords teacher candidates with opportunities for richer representation of concepts, to infuse emotional nuance, and build contextual relationships across ideas more so than any single mode could achieve alone.

Figure 1
Theoretical Framework



Methods

Research Context and Participants

This qualitative case study is situated in two undergraduate teacher preparation semester-long classes, from two consecutive semesters, fall and spring, in a Midwest university. The purpose of the course focused on developing preservice teachers' knowledge about disciplinary literacy, along with a required practicum working with K–8 learners in an after-school tutoring program. As a course assignment intended to document learning, the ePortfolio focused on multimodal artifacts that represent their developing reflective practitioner identities. As well, the assignment documented their growing knowledge and skills both in the class and in the clinical setting. In doing so, teacher candidates were asked to use design thinking and multimodal design to represent their developing teacher identities, knowledge, and skills in the digital space of their ePortfolio. For this assignment, the teacher candidates were required to build their ePortfolio on Google Sites, one of the Google Workspace Apps and Web 2.0 technologies (Schneckenberg et al., 2011). Google Sites provided affordances for creative design and multimodal compositions. A studio approach (Carpenter et al., 2012; Stivers et al., 2019) was adopted to support the teacher candidates during class time and three visual-design consultants from the Fine Arts Department were recruited to facilitate the candidates' multimodal design thinking. In the fall semester class, the visual-design consultants conducted two mini lessons to teach the candidates about visual design: one lesson about professional photos and the other about use of color. In the spring semester class, a third mini lesson was added to teach the candidates about visual structure and layout.

In the fall semester, core components required in the teacher candidates' ePortfolio were: (1) a homepage with About Me information and an overview of their ePortfolio; (2) a literacy glossary that documented candidates' knowledge of important reading comprehension, literacy strategies, and related terms; (3) one literacy tool from candidates' class presentations during the class activity, Content Literacy Tools & Materials Workshop; (4) one sample lesson plan, from their practicum experience; and (5) a final reflection, for which the candidates discussed their overall experiences with the ePortfolio and about the class in general. In the spring semester, in addition to the above requirements, the candidates were required to include two sample lesson plans, instead of one, and add an additional core component, inquiry project, because it was a newly added assignment for that class. Many candidates went beyond the above requirements and included other components, particularly teaching philosophy and related multimodal artifacts that demonstrated candidates' professional identities.

Figure 2
ePortfolio Workflow: In-Class Work Sessions

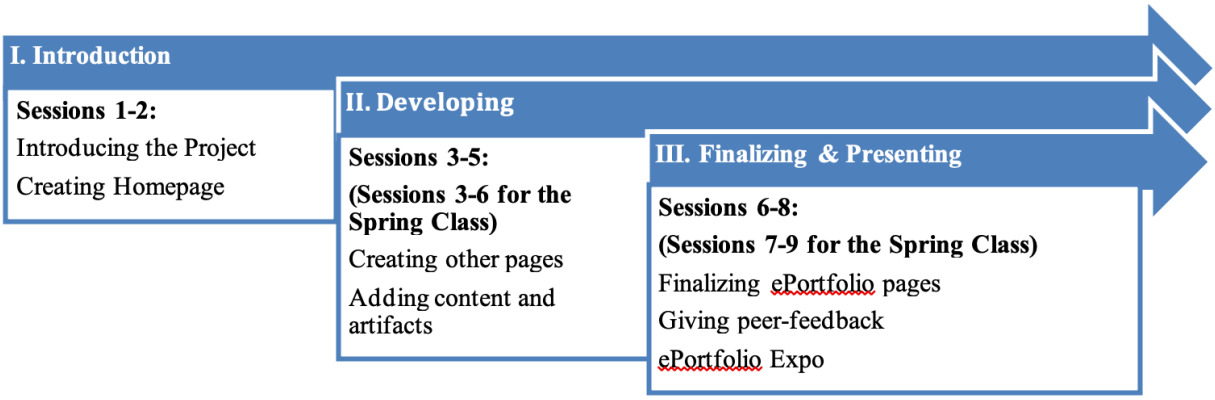


Table 1
Eight Focal Participants

Class	Name (pseudonym)	Majors and minors
Fall semester class	Aurora	Elementary Education & Language Arts/Math
	Ember	Elementary Education & Language Arts/Math
	Emerald	Early Elementary
	Louisa	Early Elementary & Language Arts
	Olana	Special Education & Language Arts
	Sandra	Elementary Education
	Teresa	Elementary Education & English/Science
Spring semester class	Lindsay	Special Education

Candidates' ePortfolios in the fall semester class were developed over eight weeks of in-class work sessions while those in the spring semester class were developed over nine weeks of in-class work sessions. These in-class work sessions were divided into three recursive and overlapping stages, as illustrated in Figure 2. The ePortfolio project began with an exploration of website samples and creating a homepage on Google Sites. Then, the candidates created the other pages and added content and multimodal artifacts on these pages. At the third stage, they provided peer reviews for each other's work. At the final in-class work session, an ePortfolio Expo was held for the candidates to showcase their presentations.

The research participants were 21 undergraduate, preservice teachers who enrolled in the above two classes: 14 from the fall semester and seven from the spring semester. Eight of them participated in the individual, semi-structured interviews at the end of the class: seven from the fall semester and one from the spring semester. Primary voices were elicited from these eight focal participants, as listed in Table 1. Most of them were in their junior or senior year: four of them majored in Elementary Education, two in Early Elementary Education, and two in Special Education. Each participant was given a pseudonym.

Data Sources and Analysis

To ensure trustworthiness, data were collected from multiple sources. Primary data included the eight focal teacher candidates' ePortfolios and semi-structured interviews. The interviews provided insight into their design-thinking process and how meanings were multimodally composed in the ePortfolios. Secondary data included the other ePortfolios created by 13 candidates who consented but were unable to participate in the interviews, participant observations the author Kuo conducted, and the visual-design consultants' work logs that documented their consulting work with the teacher candidates.

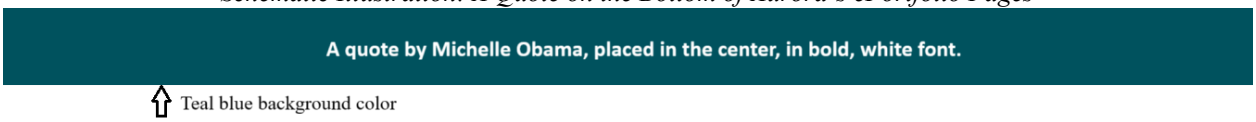
The data analysis contains the following components. First, we analyzed teacher candidates' ePortfolios with a focus on thematic elements (Riessman, 2008) and visual design (Kress & Van Leeuwen, 2021). The analysis of the ePortfolios involved the following

Table 2
Guiding Questions at the Initial Stage

Content and (academic) writing)	Visual design
What is the student trying to convey?	What is the student trying to convey?
What immediately comes to my mind?	What immediately comes to my mind?
What features are used?	What (visual) features are used?
What impressed me?	What impressed me?

Note. Adapted from Albers (2007, p. 154).

Figure 3
Schematic Illustration: A Quote on the Bottom of Aurora's ePortfolio Pages



discursive stages. In the initial stage, the homepage of teacher candidates' ePortfolios was examined based on the question: "What impression and messages do the student convey on the homepage, in terms of the content and visual design?" This initial analysis on the homepage and the other pages was guided by the detailed questions adapted from Albers (2007, p. 154), with a focus on the content and visual design elements as illustrated in Table 2. After the initial stage of analysis, emerging themes and features were identified and agreed upon, such as quality of writing, teaching beliefs and philosophy, and symbolic representations (e.g., images and use of color). In the second stage, teacher candidates' ePortfolio content and visual design were further examined focusing on the emerging themes identified in the initial stage. For example, candidates' strategic use of images and color to express individual characteristics was further analyzed after it was identified in the initial stage and is discussed further in the sections below.

The semi-structured interviews were recorded and transcribed. A thematic analysis (Braun & Clarke, 2021) was conducted on the interview transcripts and other data sets to identify emerging patterns (Glesne, 2011), which were utilized to triangulate the findings from the analysis of candidates' ePortfolio. At this stage, the visual and thematic analyses were integrated in a thematic table, which included four hierarchical columns: categories/themes (e.g., semiotic representations, personal vs. professional), codes (e.g., quotations of famous people, teaching philosophy, professional headshots, teaching pictures and artifacts, use of color to express professional self), sources (e.g., Aurora's ePortfolio and interview), and excerpts (from the semi-structured interviews, images or written texts from the ePortfolio). Furthermore, reflexive practices employed to strengthen the rigor included our reflective conversations in the initial analysis of candidates' ePortfolio and reflexive review of the thematic table that Kuo conducted (Morison, 2025).

Findings and Discussion

Two themes emerged from the above analysis and respond to the research questions of this study. The first theme is the variety of semiotic representations that showcase candidates' emerging teacher identities. Drawing from the analysis of the ePortfolio webpages, we present examples that feature semiotic representations of their developing professional and personal identities. We also discuss the use of semiotic representations with narrative data derived from candidates' semi-structured interviews. The first theme of semiotic representation sets the stage for the discussion of theme two, which highlights multimodal design thinking and helps to answer our second research question. The teacher candidates' engagement in multimodal design thinking is unveiled in two ways. First, the teacher candidates' design thinking is made visible by their choice and deliberate communication of their learning processes, knowledge, and skills. Second, the candidates' design thinking is made visible through their orchestration of multiple modes for effectively communicating their past learning, current learning, and a sense of future as they envision future employment as an education professional. To ensure participants' confidentiality and acknowledging ownership of their multimodal works, we apply thick description (Geertz, 2017) and display schematic illustrations to foreground the multimodal features of candidates' ePortfolios in lieu of the whole ePortfolio (Kuo & Sprečić, 2025).

Semiotic Representations of Emerging Teacher Identities

Semiotic representations consist of multiple sign systems from linguistic to non-linguistic forms, such as image, sound, diagrams, and language, used for the purpose of conveying meaning (Cowan & Albers, 2006). Our analysis of the candidates' ePortfolios revealed various sign systems and semiotic representations that demonstrate their emerging teacher identities. In this section, we start our discussion with the sign system of language such as quotations and narratives. Then, we move on to discuss other sign systems used to convey their experiences, such as visual components, self-portrait photography, images of teaching artifacts, other images, and the use of color.

Semiotics of Language

First, many teacher candidates used language in the form of quotes from famous people to express their teaching beliefs and philosophy. For example, at the bottom as part of the background on every page in Aurora's ePortfolio (Figure 3), she displayed a quote by Michelle Obama: "Success isn't about how much money you make, it's about the difference you make in people's lives."

In the interview, Aurora explained her thinking about this choice, "it's a presentation of what I believe. And, it is also something I can change, or if I like something better, a better quote later, I can replace it. But, it was something very representative of what I believe." Aurora further explained that the quote represents who she is and how she cares about student learning and their lives. Related to this message, Aurora wrote a statement on the page titled Biography and Teaching Philosophy that stated:

> From a very young age I knew that helping people was something that gave me great satisfaction. . . . My decision to pursue a career in teaching is due, in part, to my intrinsic desire to make a positive impact on the life of a child.

To substantiate the same message, she then shared a story about how one of her teachers made a positive impact in her life when she was an emergent bilingual learner in an eighth-grade classroom:

> Learning in a new environment where language was a barrier was not easy, but I had great teachers along the way that helped me overcome my own fears and who served as my support system. . . . Reflecting on my own struggles, was that I realized how influential a teacher can be. Mr. C (pseudonym) helped me build a bridge that has allowed me to come this far. He challenged me more than anyone had done it before and showed me I can in fact achieve more than I think. As a teacher today, I aspire to model his values and professionalism in the classroom. . . . Through my experience in Mr. C's classroom, I also learned the importance of going the "extra mile" in building meaningful relationships with my students.

Aurora was the first one among all the teacher candidates to include quotations in the ePortfolio. After peer reviews in class, several other candidates incorporated quotations to express their beliefs. Similarly, some candidates added narratives to establish more nuance and depth related to their chosen quotes. For example, on the About Me page, Olana added a quote, "Tell me and I forget, teach me and I may remember, involve me and I learn" by Benjamin Franklin. Underneath the quote, Olana wrote a vignette that reflects the emphasis of "involve and learn" in her quote. As a Special Education major, Olana described how she became interested in teaching secondary students with emotional impairments because of the influence of her family members who were also special educators. Olana reiterated the idea of "involve and learn" on her Overall Reflection page when she wrote about her practicum experiences, "I truly enjoyed this practicum because this opportunity was so hands-on; learning the material in class and then having the chance to apply what we learned to a real-life situation made the learning deeper."

Similarly, Emerald posted a quote in her ePortfolio: "Every child is one caring adult away from being a successful story" by Josh Shipp. Emerald wrote about her emphasis on becoming a caring educator on her homepage:

> I aspire to be like the teachers that I had the pleasure of having; encouraging, positive, caring, and always going above and beyond. Every child deserves to have a good, caring role model that will support them to succeed. I strive to be that person for my students.

In the interview, Emerald stated, "I added in little quotes that represent me, which puts in my personal flair."

Another example is found in Teresa's ePortfolio, in which she added a quote on the Overall Reflection page: "A teacher affects eternity. He can never tell where his influence stops" by Henry B. Adams. This quote conveys a sense of resilience and corresponds to her story of studying hard to become a classroom teacher. In the interview, Teresa elaborated:

> I think that's a message to all teachers, that throughout the tough times . . . our students are going to take what we teach them, and go on and

> influence other people. I think that's a really important message to all teachers and to myself, that there's going to be hard days, but keep pushing on. I think it's the result that's definitely worth it.

In the above examples, each candidate purposefully selected a quote to engage the viewers' imagination, with room for viewers' interpretation about the candidate's teaching beliefs. Yet, as discussed regarding the partiality of modes, a single quote only conveys meanings partially (Jewitt & Kress, 2003). The narratives or stories that the candidates added complement their chosen quotes, so both elements work together to provide a more holistic message that accentuates their teaching philosophies and guides viewers' attention to the kind of teachers they want to become in the future. The interplay of quotes and narratives provides a rich linguistic representation of teacher identities; however, these alone cannot fully capture the complexity of meaning-making. These linguistic choices, along with the visuals below, invite viewers into a different kind of interpretive engagement, where meaning is shaped not only by what is said but also by what is seen.

Semiotics of Image and Color

Candidates presented their teacher identities through the semiotics of images and color throughout the ePortfolio, including self-portrait photography, teaching artifacts, images with special meanings, and use of color. First, many of the teacher candidates utilized self-portrait photography to highlight their developing identities. Aurora, Louisa, Sandra, and several other candidates posted a professional headshot on their homepages, in which they were in business casual outfits while looking straight at the viewer. According to Kress and Van Leeuwen (2021), when a represented participant of an image gazes at the viewer, it creates a social interaction that "demands something from the viewer" (p. 116). In these teacher candidates' professional headshots, many smiled to express a sense of friendliness, "in which cases the viewer is asked to enter into a relation of social affinity with them" (Kress & Van Leeuwen, 2021, p. 117). In other words, these headshots deliver a message of invitation to engage the audience of the ePortfolio.

On the other hand, some teacher candidates included photos, in which they did not look directly at the viewer. For example, on the About Me page, one teacher candidate posted a photo of her sitting next to her practicum student and gazing at the student with a smile. This photo conveys a more complex message about her identity as a teacher to care about the student and demonstrates the notion of active teaching. The photo corresponds to her written narrative, placed beside her photo, "I love to work with children and enjoy collaborating with others," along with a story of how she "discovered [her] love for teaching at a young age."

In another example, on the Biography page, a teacher candidate posted a photo of her standing next to her student in front of a white board. In this photo, both the candidate and the student looked at the white board with their backs to the viewer. This candidate's right hand was drawing a line underneath the phrase "long vowel" on the white board, with her left hand resting on her waist. The candidate's posture in the photo conveys a message of self-confidence in teaching, which corresponds to her written narrative next to the photo:

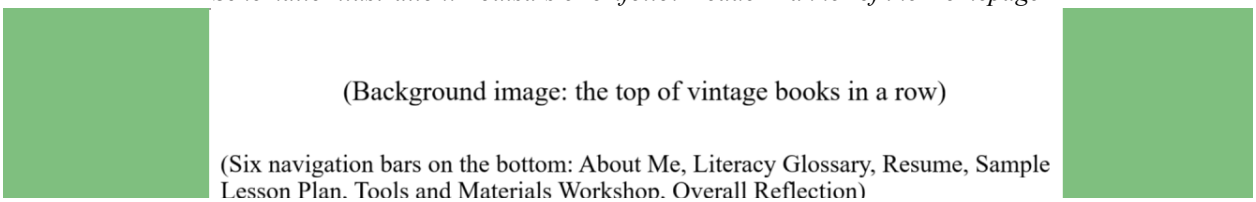
> I strive to be a teacher that encourages youth to be themselves and embrace their unique qualities just like me! I have found a love in teaching, and I hope to be an educator that impacts the next generation of youth in a positive way.

For this type of image, in which the represented participants do not look directly at the viewer, Kress and Van Leeuwen (2021) explained that this kind of image "offers the represented participants to the viewer as items of information, objects of contemplation" (p. 118). In the above two examples, which portray these two teacher candidates' teaching in action, their photos offer the viewer a message of their positive attitudes toward teaching, yet with nuanced differences. The first demonstrates a pleasant student-centered message, and the second demonstrates a sense of self-confidence. Furthermore, like the interaction between a quotation and a narrative discussed above, these two examples work together to convey a holistic message about these two candidates' emerging teacher identities.

Furthermore, some teacher candidates posted images of teaching artifacts, particularly on the page featuring sample lessons taught in the practicum. For instance, on the Sample Lesson Plan page that contains a lesson plan in written text, Aurora included an image of a puppet show, which she and Sandra created for their lesson on "retelling stories" in the practicum. In the interview, Aurora explained her intention of adding an image:

> I wanted to have some colors; I didn't want it to be all just text. . . . It makes it easier for them [viewers] to understand what I'm talking about. . . . I think I told them we used the puppet shows. . . . I put a picture here, so they know what I'm talking about when I said puppet shows . . . so it makes it more visual for them, and they see what students were seeing.

Figure 4
Schematic Illustration: Louisa's ePortfolio: Header Banner of the Homepage



In Aurora's statement, she emphasized the two purposes of her use of this image. One is to set emotional tone and contrast (i.e., "I wanted to have some colors; I didn't want it to be all just text"). The other purpose is for the image to carry additional meaning that complements the written content in her lesson plan sample to create a cohesive message, "when I said puppet shows . . . so it makes it more visual for them, and they see what students were seeing."

In addition to images of teaching artifacts, some teacher candidates intentionally chose images to communicate coherence across messages and to strengthen the meaning. For example, Louisa used an image of books as a header banner of the homepage (Figure 4) to represent her literacy educator's identity, and as a navigational cue in the form of a border. In the interview, Louisa explained the rationale behind her image choice:

> I really like books. It's something that I'm very passionate about. So, I kept trying to find different book pictures or library pictures or something, but I liked this one because these books are kind of like vintage and I like old books and stuff like that so that's why I picked it.

On the homepage, Louisa also included a section with a visual heading titled "Fun facts!" In this section, she represented the following:

> Favorite movie: Finding Nemo
> Favorite book: A Monster Calls by Patrick Ness
> Favorite activity: hiking and exploring nature
> Favorite animals: tortoise and sloths

In the interview, Louisa explained that this "fun facts" section on the homepage represents the personal aspect of her identity, in addition to her professional self:

> I felt like, any ePortfolio is like a representation of myself but on the computer, and so I didn't want it to be just my professional background, just my education. Um, because if an employer zooms in to look at this, I feel like, they want to see all the professional aspects, but they also want to see, like whom they are gonna potentially hiring, and so I wanted to include, like stuff about myself. So they can kinda get more ideas about who I am. . . . If you include yourself like fun facts, people kinda get the impression that I'm a friendly person. Um, and, also I'm kinda layback, because I think the color skim [exhilarating green] is more like layback, and it's not like bright.

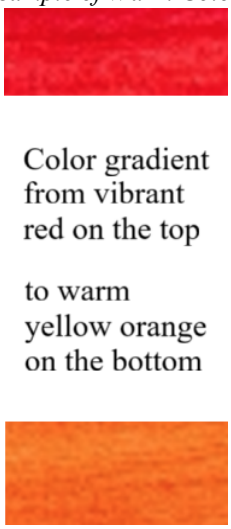
Another example of using images to create cohesive meaning and cultural associations that illustrate personal and professional identity is found in Lindsay's ePortfolio. On the Biography page, Lindsay displayed two photos side by side in the middle of the page. On the left-hand side, under the heading "OUTSIDE OF SCHOOL" was a photo of her going cross-country skiing, followed by a written description of activities she enjoys outside school. On the right-hand side, under the heading "WITHIN THE CLASSROOM" was a photo of her doing a presentation in class. Beneath the photo, she wrote about her pre-internship experiences in different classrooms at local elementary schools. In the background of this page, Lindsay placed a large image portraying still water that mirrors the sky in a lakeview, which sets the emotional tone of the whole page in a tranquil and calming dark ink blue.

Lindsay explained the inclusion of both her personal and professional aspects in the interview:

> I really wanted to specifically include stuff about myself, and personal and professional. And so like in my bio, I have like the two sections, and I really wanted to make that clear. . . . I wanted to be professional but personable. And so that's why I've put this color in because I think it's more personal and like the background and everything just to give people an idea of who I am.

During the interview, Lindsay also mentioned that she is a photographer in addition to being a college student. Lindsay took the lakeview picture and intentionally selected all the images for her ePortfolio as she noted: "So I think that [lakeview photo] conveys my personality of, being a photographer and, um,

Figure 5
Schematic Illustration: A Sample of Warm Color Choices of an ePortfolio



enjoying. I love nature, so I think it kind of brings that in a little bit, too." In this example of Lindsay's Biography page, like the above examples, each semiotic resource partially captures a side of her identity. To fully understand her developing teacher identity, the viewers need to take into consideration all the semiotics of image and color. The photos portray her out-of-school and in-class activities, along with linguistic descriptions, and particularly the lakeview image.

Moreover, Lindsay's comment, "that's why I've put this color in because I think it's more personal," brings our attention to the next visual mode used in the teacher candidates' ePortfolios: strategic and purposeful use of color. Color, like other visual modes, is its own mode with its own grammar to communicate meanings, such as companies using color in their advertisements to establish their "corporate identity" (Kress & Van Leeuwen, 2002, p. 365, 2021). In addition to the above example of Lindsay's use of dark ink blue in her ePortfolio, Aurora used teal blue (Figure 3) as the background color to set a more formal tone of her ePortfolio pages. In the interview, Aurora discussed how she changed the color from orange to teal blue after the mini lesson about using color:

> I actually ended up changing my colors after they had that session about color. It used to be like pinkish orangey, like my [ePortfolio] background. And I wasn't really happy. I ended up changing it to this [teal blue] and I really like it.

Another example of color usage is from Louisa's ePortfolio. As illustrated in Figure 4, she used exhilarating green as the background color of her ePortfolio because it was her favorite color, which she chose to express calmness and to match the header banner image (Figure 4), as she explained in the interview:

> They [the visual consultants] kind of talked about green being calming and stuff like that, so that's another reason that I picked it, and I wasn't trying to pick anything that was too bright. Originally, I had yellow as my background, and I changed it to purple and pink. I had a lot of different colors. . . . I ended up with green and I like it because, I also wanted, like the [vintage book] picture in the banner to match, to kind of go with the background, cause the banners on every page. So, I wanted those two to connect. And I kind of found the banner [with the vintage book picture] first, and then picked the background color to go with that.

Kress and Van Leeuwen (2002) explained that people use color to "present themselves and the values they stand for . . . in the context of specific social situations, to say 'I am calm', or 'I am energetic'" (p. 349). In Lindsay's, Aurora's, and Louisa's ePortfolios, they all used cold colors (i.e., dark ink blue, teal blue, and exhilarating green respectively), to express a sense of quietness and calmness, a choice commonly made by many other teacher candidates in the classes. On the other hand, a few teacher candidates chose warm colors to express passion and creativity. For example, a teacher candidate set the tone of her ePortfolio background with a linear color gradient in watercolor texture from vibrant red on the top of the page to warm yellow orange on the bottom of the page. Figure 5 presents a sample of this teacher candidate's color choices in her ePortfolio.

On her Reflection page, she wrote that she wanted to make her pages "aesthetically pleasing." On the upper right corner of this Reflection page, she also drew an image of the sun, with bright yellow in the center, then spread outward in orange and red. In addition, she drew an image of flowers in a variety of yellow, orange, pink, and red colors, which brings up a sense of playfulness, and placed it on the bottom of her ePortfolio pages. Her choice of warm colors and visual design highlights her artistic self, as she wrote on her About Me page: "I also enjoy painting, drawing, knitting, and everything that allows me to be creative. These qualities would be an asset to a school that is looking for someone who is creative."

Through all the examples above, it is evident that the candidates' emerging teacher identities are "mediated" (Mockler, 2011, p. 125) through their intentional use of semiotics to represent emotion, tone, salience of importance, and a brand identity. Some candidates adopted famous quotations, accompanied by narratives or personal stories, to feature their teaching beliefs and philosophy. Some utilized various types of visual components, including self-portrait photography with different gazes (e.g., directly at the viewer versus looking away from the viewer), artifacts of teaching materials, images with special meanings, and strategic use of color to represent a sense of self. These visual modes are not simply decorative. They communicate specific hierarchical, symbolic, and functional meanings related to their developing teacher identities, which included a professional self, such as through Louisa's vintage book image, Lindsay's photo of herself making a presentation, Aurora's color choice of teal blue, Louisa's fun facts section of her ePortfolio, Lindsay's photo of her in an outdoor activity, and the other candidate's ePortfolio with warm color choices, sun with bright yellow, orange, and red colors, and the flower image. These semiotic examples accentuate the complex professional and the personal representations of teacher identity development.

More importantly, with an emphasis on multimodal approaches to design thinking, all the above semiotic resources, both linguistic and visual, work together to convey a more holistic and complete message of candidates' developing teacher identities. Different from a traditional stance on portfolios that focus on presenting candidates' knowledge and skills, ePortfolios provide a fluid digital space for preservice teacher candidates to select different modes of semiotic representations that are critical to expressing themselves through thoughtful design.

Design Thinking Through Multimodal Expressions

Teacher candidates' semiotic representations of their emerging identities through ePortfolios manifest through an analysis of two prominent features of their design thinking: deliberate choices and design thinking continuity. For the first feature, as the candidates explored the dynamic nature of the digital space, they engaged in design thinking by making deliberate choices to create multimodal meaning for the viewer. In other words, the candidates' design-thinking processes are made "tangible" (Carlgren et al., 2016, p. 47) by various multimodal expressions through the ePortfolio. Take the teacher candidates' color choices: some selected cold colors, such as exhilarating green in Louisa's ePortfolio and teal blue in Aurora's ePortfolio, because these colors represent calmness, while a few other teacher candidates chose warm colors, such as a red-orange linear color gradient portrayed in Figure 5 to highlight a different teacher quality (e.g., creativity).

In addition to color choices, candidates' deliberate choices of multimodal expression are apparent in the intentional design of visual structure and layout of the ePortfolios. For example, in Lindsay's ePortfolio, she intentionally created a two-column structure on the Biography page to include her "Outside of School" and "Within the Classroom" experiences, which emphasize both the personal and the professional aspects of her identities. Such design to promote both the professional and the personal aspect is also articulated on Louisa's About Me page, in which her choice of the vintage book image (Figure 4) highlights her literacy educator's role and a fun facts section features her friendly personality. The intentional design to exhibit both professional and personal identities resonates with the dynamic, multifaceted, and contextual nature of teacher identities as discussed in the preceding section.

Another example of deliberate choices of design thinking is characterized by Aurora's use of images, quotes, colors, and other multimodal variations that represent her teaching philosophy. In addition to the selection of teal blue as the background color, her design thinking is made visible through showing a quote by Michelle Obama and sharing her story as an emergent bilingual learner to express her teaching philosophy, and through displaying the image of the puppet show station from her practicum session to showcase her teaching of a literacy lesson, all of which were purposefully designed to demonstrate her emerging teacher identity. In addition to posting static images, such as the puppet show station photo, Aurora embedded other multimodal resources such as Google Slideshow, retrieved from her class presentation slides, to draw the viewer's attention to her growing knowledge of literacy strategies and tools. In the interview, Aurora described her design thinking process when she created these different multimodal components:

> I just uploaded the slides that we used in class . . . when you go to "insert," you can go right to "Google," and this says "Presentation." . . . There are a lot of Google things that you can upload, like document and Google Map, and things like that. . . . I tried to explore the site to see what things I could do. . . . I wasn't familiar with that. So, it was really hard to know what I could do with that or not, so I spent the whole afternoon, just going through the tab, just playing around with it, playing with the colors and everything. . . . I spent a lot of time doing this (laughing), but . . . now I feel comfortable using it.

The second form of design thinking is revealed through a sense of continuity as illustrated in Aurora's comment: "just going through the tab, just playing around with it, playing with the colors and everything." Design thinking continuity is conceptualized as how designers "[try] things out in an iterative way, and moving between divergent and convergent ways of thinking" (Carlgren et al., 2016, p. 47). Design thinking continuity involves "critical consciousness," which relates to a creator's ability to "feel, to pay attention to nuance, to act and appraise the consequences of one's choices, and revise and then to make other choices" (A. Wells, 2013, p. 625). Design thinking in this regard constitutes a creative, dynamic, interactive, and reflective process of inquiry and problem-solving. In Aurora's case, she explored different functions among Google Apps, "played around" with color choices, and considered different visual structures, such as static images versus slideshow presentations.

In the interview, Aurora also explained how she would expand the scope of her ePortfolio in the future beyond just a class assignment: to make it more personal and add more work experiences. This speaks to a sustainable mindset that becomes iterative in future contexts. Aurora further described a story about her experiences at a job interview for a teacher position. During the job interview, she showed the Biography and Teaching Philosophy page of her ePortfolio to the interviewers at the school. She described:

> Just because they asked me what my philosophy was, I show them [the teaching philosophy page], I think they were impressed. . . . They said, we can see that you have put a lot of time in this. . . . I talked about it [teaching philosophy] and they were reading through it [the teaching philosophy page].

Aurora also explained that she had future employers in mind when she developed her ePortfolio:

> That's why I also added things from TK20 [to this ePortfolio] because I wanted them [future employers] to see I have that in there. I want it to be something I can present to now and future employers. I could always keep updating it.

Aurora's experience at her job interview resonates with Kitchenham's (2008) research that "prospective employers saw the e-portfolios as an impressive demonstration of not only their technological prowess but also the students' teaching qualifications" (p. 147).

Other teacher candidates also demonstrated their design thinking continuity related to their future use of the ePortfolio. For example, Teresa planned to include a link to her resume to make it accessible for her future employers. In Lindsay's case, she discussed how her ePortfolio presented an "online presence" of herself that can facilitate her interaction with others in the professional setting:

> Just having this as a way to create my own website for my classroom and having this to show in interviews and stuff would be super helpful just because I have my examples of my work right there. . . . just give myself an online presence that I wouldn't have otherwise. . . . I want to keep it and present it to different professionals just as a way of showing who I am.

In the above examples, Aurora, Teresa, and Lindsay discussed what future employers might look for in their ePortfolios. Using ePortfolios fortifies preservice teacher candidates' transition to employment (Cordie et al., 2019). Strudler and Wetzel (2011) advocated that the process of creating the ePortfolio prepares teachers to better respond to job-interview questions, as demonstrated in Aurora's case above. Several teacher candidates stated that they would continue to improve their ePortfolio and would consider sending their ePortfolio with their future applications for teaching positions. Furthermore, their comments demonstrate an awareness of multiple audiences in their design thinking continuity. The feature of design thinking continuity also brings forward the authentic, iterative, and sustainable nature of ePortfolios, particularly in the connections to the candidates' professional identities and future lives (Cordie et al., 2019).

Conclusion and Implications

In this article, we outlined a study that employed an ePortfolio project as a semiotic medium, through which undergraduate teacher candidates engaged in design thinking and utilized multimodal expressions to construct and represent their emerging teacher identities. In the digital space of their ePortfolios, the candidates presented themselves by strategically using semiotic representations that included language components (e.g., quotations with supporting narratives or stories in Aurora's and in Olana's ePortfolio), as well as other multimodal components, including self-portrait photography, teaching artifacts, images with special meanings (e.g., Lindsay's use of the

lakeview picture, as well as "Outside of School" versus "Within the Classroom" photos), and strategic use of color (e.g., Aurora's use of teal blue, Louisa's use of exhilarating green, and Lindsay's use of dark ink blue). Their design thinking is made visible through the multimodal semiotic representations that were intentionally selected to promote professional and personal selves. Finally, their design thinking featured a sense of continuity as they explored and experimented with the digital space and planned to revise and modify their ePortfolios for future iterations. In what follows, we draw implications that address challenges and opportunities because of this study.

To address challenges, especially in ePortfolio implementations (Luera et al., 2016; Peacock et al., 2010), one challenge points to adequate time and support to work on the ePortfolio. In this study, although class time was allocated with the visual consultants' support through a studio approach, some candidates indicated the need for more structured support during the in-class work sessions, as well as for specific guidelines that differentiate in-class and at-home preparation tasks. Some challenges may also be related to "negative attitudes to technology and ePortfolios" (Peacock et al., 2010, p. 837). For example, Ember explained in the interview that she would prefer doing things on paper because it takes so much time to create and to make ePortfolios look professional, although she understood the drives in the digital era. To address this issue and to increase buy-in, Luera et al. (2016) recommended that instructors "identify core values of the ePortfolio as early as possible in the project" (p. 135).

Despite challenges regarding ePortfolio implementations, we identify opportunities that positively support teacher identity development. First, utilizing multimodal expressions in the design process cultivates agency in the candidates, such as Louisa's deliberate use of a vintage book image in her ePortfolio to express her love for books and her identity as a literacy educator. Moreover, the candidates can develop knowledge of digital literacies (Andersen & Pitkänen, 2019; Jones & Hafner, 2021) as they engaged in the design thinking process. For example, in Aurora's case, she actively explored and considered the affordances and constraints of different digital materials (e.g., various Google Apps, static images versus Google Slideshow) through this ePortfolio project.

Furthermore, the above findings and discussion call attention to the fact that ePortfolios are not simply a collection of academic artifacts to demonstrate learners' knowledge. The opportunities to cultivate preservice teacher candidates' agency as they form their professional identities through multimodal ePortfolio design interrogate the traditional view on preservice teacher candidates as "technician, consumer, receiver, transmitter, and implementer of other people's knowledge" (Cochran-Smith & Lytle, 2008, p. 42). In this study, utilizing ePortfolios through a multimodal approach creates an authentic and creative environment, in which the preservice teacher candidates incorporated design thinking and problem-solving skills. When ePortfolios are developed through a multimodal approach informed by design thinking, the tension between objective and subjective philosophies (Strudler & Wetzel, 2011) shifts from an oppositional stance to a dialogical continuum. Additionally, this study can be applied in other disciplines, in which students create ePortfolios to multimodally express their growing knowledge and developing identities that reflect the unique nature of their field.

As the work of teacher educators with preservice teacher candidates is heavily focused on facilitating the transformation from thinking as a learner to a professional educator who facilitates learning (Garza et al., 2016), an ePortfolio project through a multimodal approach fortifies this transformational work. The ePortfolio project empowers preservice teachers with agency as they engage in design thinking, review and reflect on their learning trajectory, and transform their identities from learners to professionals (Whitney et al., 2021). These components are essential in an era when classroom teachers and teacher educators must navigate dynamic changes and address increasingly complex issues.

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A Formative-Assessment ePortfolio for Learning Competencies: From Hype to Psychopedagogy

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Widely implemented across higher education, ePortfolios are often portrayed as powerful learning tools. However, despite growing recognition, their conceptual ambiguity, diverse implementations, and varying outcomes continue to fuel debates. In many cases, an emphasis on technological aspects over psychopedagogical considerations has led to tensions, failures, and rejection. We argue that ePortfolios must be meaningfully aligned with psychopedagogical objectives to ensure effective implementation and learning outcomes. Our primary goal is to present a formative-assessment ePortfolio model designed to support the development of learning competencies in undergraduate higher education. Grounded in socioconstructivist, cognitivist, and systemic theories, our model integrates structured feedback loops, learner agency, and flexibility to support self-directed and deep learning. Key conditions for successful adoption include a clearly defined pedagogical design, continuous guidance, and adaptability. Beyond presenting the model, we aim to clarify its conceptual foundations, demonstrate its applicability across disciplines, and provide insights for researchers and practitioners. Implemented within a third-year Education Sciences program, it fosters cognitive learning dimensions, learning regulation, cooperative learning, and professionalization while offering an alternative to traditional assessment. Future research should further investigate its transferability and impact, helping to refine and strengthen the proposed model.

The digital portfolio, or ePortfolio, is widely used and recognized as the eleventh high-impact practice by the American Association of Colleges and Universities (Lu, 2021; Watson et al., 2016). It is also widely praised in academic discourse, with many publications highlighting its benefits. Despite this recognition and growing adoption, it is frequently romanticized and portrayed in an overly idealized manner (Mueller & Bair, 2018). However, its actual impact remains debated. As Meeus et al. (2006) stated, "the concept of ePortfolio has many different meanings" and can be seen as a "container concept" (p. 127) due to its diverse forms, applications, and implementations in higher education.

This ambiguity, coupled with unclear practices and inconclusive evidence, fuels controversy, as the term ePortfolio can refer to fundamentally different pedagogical objects depending on the context—from a summative certification tool to a professionalization space, or to a reflective learning journal. Comparative studies confirm that, in practice, these meanings diverge widely across levels (undergraduate vs graduate), fields (professional programs vs general education), and intended functions (presentation, assessment, learning, or development; Fischer et al., 2020; Meeus et al., 2006; Petit & Bélisle, 2018; Petit et al., 2018). When the purpose is not explicitly framed, instructors and students tend to infer their own interpretation, which may diverge from the intended pedagogical aims (Lu, 2021). The issue is therefore not multiplicity per se, but the absence of boundary conditions: without a clearly articulated purpose, the ePortfolio remains polysemic, making it difficult to use and to assess consistently. In short, what is called ePortfolio in one program may mean a certification dossier, while in another it is a reflective learning pathway—two pedagogical uses that can be fundamentally incompatible in practice (Fischer et al., 2020) yet hidden under the same label.

In the Francophone higher education context, the expansion of ePortfolios—closely tied to the generalization of the Competence-Based Approach—adds another layer of complexity, particularly because assessment practices remain largely summative and disciplinary in nature (written exams, synthesis papers, oral presentations), with little space for formative feedback or reflective learning. In this context, the introduction of the ePortfolio represents not merely a change of assessment format, but a pedagogical shift toward making learning processes explicit, requiring students to articulate, justify and document their development rather than reproduce disciplinary knowledge (Coulet, 2024; Ferrier, 2024, 2025; Le Boucher et al., 2019; Messaoui & Pélissier, 2024; Romainville & Fischer, 2020). Therefore, unlike the North American context, their implementation requires a cultural and pedagogical repositioning. ePortfolios not only introduce a new medium but also challenge entrenched assessment norms and require sustained guidance to help instructors and students navigate this shift from product-based evaluation to process-based learning—in other words, from showing a result to making learning visible (Ferrier & Connac, 2025a; Le Boucher et al., 2019; Romainville & Fischer, 2020).

On the other hand, the flexibility of ePortfolios makes them both trendy and powerful, easily adaptable to users' needs—for example, for either formative or summative assessment, and for profession-specific or learning-related competencies (Le Boucher et al., 2019; Meeus et al., 2006). In this context, ePortfolios provide

an alternative, performance-based, and authentic assessment method, distinct from traditional end-of-course certification tests, while fostering reflective thinking and deep learning (Abrar-ul-Hassan et al., 2021; Lu, 2021; Segaran & Hasim, 2021; Wade & Yarbrough, 1996). However, the same structural openness that makes ePortfolios versatile also generates interpretative uncertainty, making ePortfolios difficult to define or assess without clarifying their context, purpose, and learning objectives. Therefore, many professionals struggle to fully grasp what ePortfolios entail and how to design, implement, and use them effectively. This challenge extends to undergraduate students, who often lack a clear understanding of what an ePortfolio is or how to engage in the deep learning, long-term reflection, and metacognitive processes it requires.

This confusion stems from the fact that flexibility, although often presented as a strength, becomes problematic when the pedagogical intentions and assessment criteria are not made explicit. As Meeus et al. (2006) demonstrated, a proliferation of overlapping typologies and purposes of ePortfolio obscures rather than clarifies what is expected from both instructors and learners. In a similar vein, Lu (2021) showed that without a clearly framed guidance structure, openness tends to dilute formative learning because students struggle to understand what is meant to be learned and on which basis it will be assessed. The issue is therefore not flexibility itself, but the absence of conceptual and practical boundaries—much like improvisation in jazz, which only becomes meaningful once the jazzman has fully mastered the underlying structure.

Consequently, many implementation attempts fail to produce meaningful outcomes, exposing tensions between pedagogical intentions and actual perceptions and results (Boéchat-Heer, 2018; Boéchat-Heer & Vallat, 2019; Fischer et al., 2020; Fischer & Romainville, 2020; Meeus et al., 2006; Mueller & Bair, 2018; Petit & Bélisle, 2018; Petit et al., 2018; Romainville & Fischer, 2020; Segaran & Hasim, 2021; Tessaro, 2020; Tochel et al., 2014; Wade & Yarbrough, 1996; Zeichner & Wray, 2001).

Beyond these conceptual ambiguities, ePortfolios are often implemented in a top-down manner, with little pedagogical support (Fischer et al., 2020; Messaoui & Pélissier, 2024; Mueller & Bair, 2018). The emphasis is typically placed on their technological features (Pélissier & Messaoui, 2024), rather than on an innovation-driven approach centered on the educational act (Cros, 2019). Paradoxically, when introduced without pedagogical framing, these technologies often create more obstacles than benefits for learning (Boéchat-Heer & Vallat, 2019; Petit & Bélisle, 2018; Petit et al., 2018; Tessaro, 2020).

To address these converging limitations, we advance a clear psychopedagogically grounded model and methodology for implementing an innovative formative-assessment ePortfolio in undergraduate education. Given the multiplicity of interpretations surrounding ePortfolios, conceptual clarity is crucial for successful implementation. Our primary objective is to clarify our ePortfolio model to prevent misconceptions and rejection by grounding it in a robust theoretical framework. The second objective is to propose a model that is both adaptable and transferable across disciplines, student cohorts, and institutions. After clarifying the ePortfolio's definition, context, and theoretical foundations, we detail our model and provide an overview of its impact, particularly on cognitive dimensions, self-regulation, cooperative learning, and the professionalization process.

Theoretical Foundations of Formative-Assessment ePortfolios

To better define ePortfolios, it is crucial to acknowledge their pedagogical implications. As Meeus et al. (2006) stressed, ePortfolios are not neutral tools and "cannot be used indiscriminately within an educational vision. Nor is it a learning tool suitable for all competencies" (p. 127). On the contrary, to fully harness the potential of an ePortfolio, its conceptual framework must be clearly defined and integrated into its design and implementation. Rather than relying on a simple "to-do list" for implementation, there is a fundamental need to integrate ePortfolios meaningfully into pedagogical design and learning objectives, avoiding both "romanticization" and techno centrism. Mueller and Bair (2018) used the term romanticization to refer to the tendency in ePortfolio literature to highlight its transformative or "high-impact" potential while downplaying the practical and pedagogical challenges associated with implementation—such as student or instructor resistance, workload, or lack of guidance. In other words, the idealized discourse surrounding ePortfolios often contrasts sharply with the complexity, uncertainty and friction observed in real teaching situations. This gap between the promises attributed to the tool and its actual uptake in practice contributes to a narrative that celebrates the ePortfolio more than it interrogates the conditions under which it effectively supports learning. By techno centrism, we refer to a different but related mechanism: the implicit belief that the introduction of a digital tool, in and of itself, is sufficient to improve learning or assessment (Tricot, 2017). In the case of ePortfolios, this techno-solutionist stance tends to constrain rather than expand pedagogical possibilities, especially when the tool is implemented without guidance, a clearly articulated pedagogical project or reflective design framework (Boéchat-Heer & Vallat, 2019; Pélissier & Messaoui, 2024; Petit & Bélisle, 2018; Petit et al., 2018; Tessaro, 2020).

Fundamentally, ePortfolios are grounded in socioconstructivist, cognitivist, and systemic frameworks, in which interaction and guidance play a crucial role in learning (Abrar-ul-Hassan et al., 2021; Dévé et al., 2009; Lu, 2021; Meeus et al., 2006; Petit & Bélisle, 2018; Verslype et al., 2017). Therefore, beyond clear institutional support, pedagogical planning, and structured guidance, the conceptual framework underpinning ePortfolios must be well understood and carefully considered when implementing them in a course or, even more critically, at the institutional level. This issue is particularly salient in traditional French universities, where end-of-course summative assessment—especially in Cours magistral (lecture-based) settings—has long been the dominant, if not the only valued, norm.

A key challenge is, therefore, breaking away from vertical knowledge transmission and certification-driven assessments toward formative approaches (Connac, 2016). This shift also calls for a change in posture for all stakeholders (learners, peers, and instructors), moving from passive roles to active co-participation in both learning and the ePortfolio process (Boéchat-Heer & Vallat, 2019; Petit & Bélisle, 2018; Romainville & Fischer, 2020). This shift in posture is not merely behavioral but epistemic: engaging in an ePortfolio requires students to become what Albero and Nagels (2011) called maîtres d'usages—that is, agents who construct meaning through the situated organization of their own activity rather than recipients of preformatted expectations. In Jonnaert's (2011) perspective, competencies are not pre-existing attributes but enacted within the activity itself, through a dynamic process of engagement, reflection, action, and adaptation in often unstable learning situations, rather than through the reproduction of predefined outcomes.

Pedagogically, this corresponds to a continuum ranging from a "seated school" of transmission, to a "standing school" of task execution, and ultimately to a "school of movement" in which learners become authors and regulators of their own learning (Collot, 2002). Such a posture, aligned with type-3 pedagogy, relies on cognitive self-regulation (Cosnefroy, 2010) and on the learner's ability to stabilize and render their own learning trajectory intelligible over time—what we have conceptualized as an organizational closure of learning (Ferrier, 2024).

This epistemic shift also redefines the instructor's role: instead of transmitting knowledge or evaluating a finished product, the instructor becomes a guide who creates the conditions for learning to emerge through co-participation and iterative feedback—a posture that remains uncommon within traditional university assessment. In this sense, ePortfolios are not merely reflective tools but structural mediators of a transformation in how learning is enacted, recognized and sustained. They therefore represent more than a technological innovation: they reconfigure roles and responsibilities, reshaping the very grammar of teaching and learning in higher education. Co-participation is thus not an optional pedagogical feature but a systemic and structural condition for the learning model mobilized by ePortfolios.

In ePortfolios designed to develop learning competencies, students select works—based on peer and instructor guidance and feedback—that reflect their own learning journey. The instructor evaluates the quality of the learning process rather than merely assessing the final work itself, highlighting the importance of regular guidance, support, and feedback. Students should have the opportunity to document both their learning process and challenges in a safe environment, fostering learner agency, deep learning, reflection, and the development of learning competencies. Consequently, ePortfolios can bring significant value to higher education, as there are currently few tools that better support and assess students' learning competencies (Meeus et al., 2006).

Despite their potential, two critical dimensions of ePortfolios remain largely underestimated in both literature and practice: their role as a formative assessment tool and as a pedagogical approach (Abrar-ul-Hassan et al., 2021). Yet, "the fundamental principle underlying ePortfolio aimed at learning competencies is to foster a self-directed learning process" (Meeus et al., 2006, p. 133). This underestimation is well documented in both the literature and in practice. Most studies still conceptualize ePortfolios primarily as assessment products or repositories of evidence, while far fewer examine the ePortfolio as a formative process. Likewise, its pedagogical dimension remains largely underexplored in empirical research (Pélissier & Messaoui, 2024; Petit & Bélisle, 2018; Tochel et al., 2014). Although widely used as tools for documenting life skills or certifying professional competences, ePortfolios are far less frequently approached in higher education as authentic assessment-for-learning devices. Yet, drawing on contemporary work in educational assessment (Cieutat & Connac, 2021; Muller & Normand, 2013) and updated theories of formative assessment (Hadji, 2012), ePortfolios have the potency to support learning through a dual mechanism: by providing iterative feedback throughout the construction of ePortfolio pieces, and by allowing students to revise and resubmit their work until it meets the intended learning outcomes.

According to Lu (2021), ePortfolios are deeply rooted in Kolb's experiential learning theory (Kolb, 1984), Deci and Ryan's self-determination theory (Deci & Ryan, 1985), and Zimmerman's Self-Regulated Learning approach (Zimmerman, 2013). Among other influences, we can also add Pekrun's work on the regulation of academic emotions (Pekrun, 2006; Pekrun et al., 2002), as well as Freinet's

classic yet still alternative approach to Pédagogie nouvelle (Freinet, 1964), particularly regarding the role of experience and cooperation in learning. Following Meeus et al. (2006), ePortfolios can also be seen as a Vygotskian psychological tool that expands a learner's zone of proximal development (see also Pélissier & Messaoui, 2024).

The wide variety of ePortfolios makes their definition a complex task. Nevertheless, drawing on the five invariants identified by Wade and Yarbrough (1996), we can outline the essential components to consider when designing a course based on learning competencies and ePortfolio assessment. (a) ePortfolios should reflect development and learning over time, typically spanning a long period such as a semester or an academic year, and should include more than just one or two items, pieces or themes. (b) ePortfolios benefit both teachers and students. For students, they offer a platform to document and reflect on their learning. Simultaneously, they provide teachers with a valuable tool to assess students' progress and achievements. (c) ePortfolios should offer students opportunities for choice, allowing them—based on instructor and peer guidance and feedback—to decide which items to include and how to structure them. Additionally, students may have a say—or at least a clear understanding—of which aspects are assessed and the criteria used for evaluation. (d) ePortfolios should showcase authentic student-produced work, reflecting the learner's own effort and development, and capturing forms of growth and potential that traditional one-shot tests cannot reveal. They are intended as powerful tools for authentic, self-directed, and deep learning. In this sense, student-produced refers to work that is created and meaningfully integrated by the learner, rather than plagiarized, externally generated (e.g., by AI), or assembled without personal engagement. (e) ePortfolios should act as a self-reflection tool, enabling students to analyze their work and set future goals. By reviewing their early efforts and comparing them with later pieces, they can track their progress and recognize their growth over time (Wade & Yarbrough, 1996).

As Zeichner and Wray (2001) noted, a critical factor distinguishing different types of ePortfolios is who determines their content and the extent to which this is predefined or left to students to decide which pieces to include. Three main ePortfolio conceptions are generally distinguished. The first is instructor-oriented, reflecting the instructor's expectations and intentions. The second is learner-oriented, where, due to flexible guidelines, learners construct it individually. The third is learning-oriented, emphasizing acquired competencies and problem-solving through individual and/or collaborative approaches (Petit & Bélisle, 2018). Finding a balance among these three approaches—prescribed pieces and possibility of choice, self-selected evidence, and both individual and cooperative work—may be the most effective strategy.

Another challenge concerns the organization of ePortfolios. Once again, the best approach likely involves a well-balanced structure that combines a predefined framework (e.g., introduction, selected pieces, reflective sections, and conclusion) with the flexibility for students to fill each section with their own work and tools, ensuring alignment with expected learning outcomes and requirements. However, this flexibility may also lead to avoidance strategies, as some students choose tasks perceived as easier or less cognitively demanding. Flexibility becomes pedagogically meaningful only when anchored in explicit learning intentions and assessment criteria. This framework accommodates formative, summative (certification-oriented), self-, and peer assessment (Abrar-ul-Hassan et al., 2021; Le Boucher et al., 2019; Petit & Bélisle, 2018).

Beyond their structure and organization, the effectiveness of ePortfolios also depends on how they are implemented and supported throughout the learning process. The impact of ePortfolios stems from three key factors: the construction process, guidance, and feedback (Zeichner & Wray, 2001). In this regard, the role of guidance, mentoring, and social interaction among learners, peers, and instructors is particularly significant. Indeed, students are often not well-prepared nor accustomed to being responsible and self-directed in their academic learning. Numerous studies have underscored this aspect and highlighted how support, regular feedback, interaction, and cooperation are crucial for a successful ePortfolio experience (Abrar-ul-Hassan et al., 2021; Dévé et al., 2009; Mueller & Bair, 2018; Petit & Bélisle, 2018; Petit et al., 2018; Segaran & Hasim, 2021; Verslype et al., 2017). Instructor and peer mentoring can be integrated into ePortfolio construction through regular checkpoints to review and discuss artifacts. Encouraging cooperation and peer review within the ePortfolio guidelines also support engagement. Together, checkpoints and a clear timeline foster sustained engagement and co-construction throughout the process, rather than limiting involvement to the final deadline.

Against this backdrop, we designed a formative-assessment ePortfolio focused on learning competencies. This original ePortfolio was implemented with third-year undergraduate students in Education Sciences (Licence 3). It was introduced at the beginning of the second semester to ensure that students had acquired the necessary technical skills to work with relative autonomy in addressing complex situations (Meeus et al., 2006; Petit & Bélisle, 2018).

This ePortfolio model was developed in response to a set of recurrent pedagogical limitations observed in previous assessment modalities in our teaching context and literature. Traditional summative exams typically fostered surface-level learning and short-term retention, with minimal evidence of transfer, cognitive and

regulatory development, cooperative engagement, reflexive thinking, or the authentic enactment of competencies. Even when coursework replaced high-stakes exams, students often produced assignments that complied with formal expectations without authentically demonstrating the construction of competencies—a phenomenon reinforced today by the availability of generative AI tools that can produce "plausible" but derivative work. The challenge was therefore not only to move away from summative testing, but to design an assessment environment where students would have to become the authors of their learning process rather than the executors of a task with expected outcomes. In addition, in the French context, universities are increasingly expected to prepare students for professional transitions, which requires assessment formats that make the developmental trajectory of competencies visible (Postiaux & Romainville, 2011). This diagnosis also emerged from the students themselves. Indeed, several reported that previous assessment formats—which they referred to as "one-shot tests with no memory lasting"—did not allow them to show how and what they had really learned, but only to reproduce expected answers (Ferrier, 2024). The ePortfolio model was conceived precisely to respond to these three blind spots: surface learning, delegation of authorship, and the absence of a space where learning and professionalization can be enacted rather than merely declared. From this starting point, the model was structured so that authorship, feedback, and progressive competency enactment became the core mechanisms of assessment rather than its by-products. Thus, in our model, the ePortfolio is not designed as a digital showcase but as an activity system in which learning becomes observable through iteration, feedback, and progressively enacted authorship.

A Formative-Assessment ePortfolio Model for Learning Competencies

The model has been implemented in a course on General Pedagogy and Comparative Didactics at Paul Valéry University in Montpellier (France) during the 2022/23 academic year, with third-year undergraduate students in Education Sciences. The course includes lecture sessions, held for two hours per week for a large group of students (Cours magistral, 26 hours from January to May), and discussion sessions in smaller groups, three hours every three weeks (Travaux dirigés, 13 hours). The ePortfolio is introduced just before students choose their master's specialization, ensuring its relevance within the curriculum and supporting their professional development. The instructor is a full university professor specializing in Education Sciences with extensive experience in ePortfolios, fully meeting the expertise requirements (Boéchat-Heer & Vallat, 2019; Meeus et al., 2006; Petit et al., 2018; Tessaro, 2020).

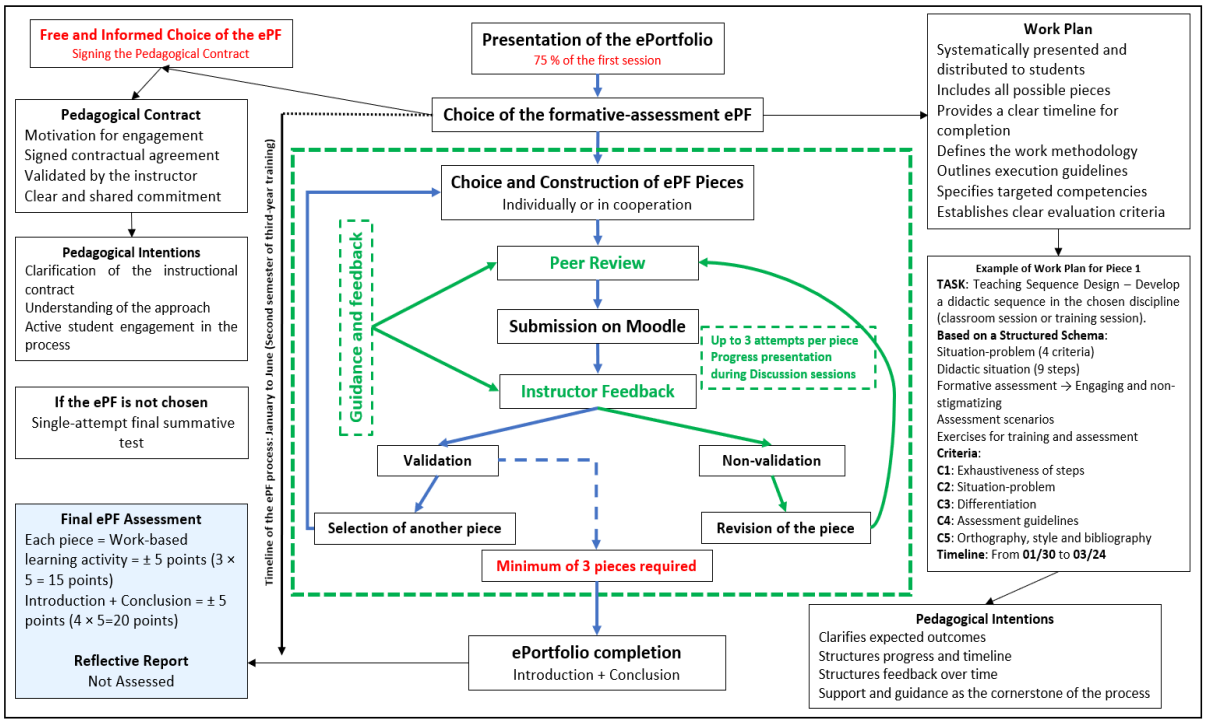
Figure 1 provides a visual representation of the formative-assessment ePortfolio model, illustrating the structured feedback loops, the role of peer and instructor review, and the integration of pedagogical intentions. The model seamlessly integrates the three types of ePortfolio conception: the instructor's intentions, the learner's autonomy, and the necessity of documenting learning traces, either individually or cooperatively. It also involves the four types of assessment: formative, self-assessment, peer assessment, and certification-based assessment.

During the first lecture session (mid-January), the ePortfolio is presented in detail to students, who can then choose between a traditional summative one-shot end-of-course test or engaging in the process. In both assessment formats, the same learning outcomes are at stake. This informed choice is formalized through a pedagogical contract (see Appendix A), ensuring clarity among stakeholders (learners, peers, and instructor) and confirming that the student fully understands not only the option itself but also the implications and responsibilities attached to it (Fischer et al., 2020; Romainville & Fischer, 2020). The ePortfolio is supported by Moodle tools within the university's digital learning environment.

When constructing their ePortfolios, students may select the digital tools they deem most appropriate to achieve the expected learning outcomes. Thus, flexibility should not be understood as permissiveness, but as a bounded space of choice aligned with competency development. The only mandatory requirement is to upload their files (the pieces) to the Moodle cloud—which is dedicated to ePortfolio construction and feedback loops—within the specified timeframe for each piece. Allowing students to choose their own digital tools is a crucial decision, as it: (1) helps avoid pitfalls related to the lack of mastery of various ePortfolio technologies among different stakeholders (instructors, students, designers, technical services, administration, etc.); (2) ensures that tools align with task requirements without unnecessary features that could interfere with execution and comprehension; and (3) fosters a complexity-oriented approach to learning by leveraging tools that facilitate feedback and iterative revision of student work. Thus, rather than adopting a technology-centered approach, we deliberately chose to emphasize the pedagogical foundation of the ePortfolio. From a psychopedagogical standpoint, this decision can enhance students' mastery of their Personal Learning Environment and strengthen their self-efficacy in using digital learning tools (Boéchat-Heer, 2018). Moreover, ePortfolios often present challenges due to the technologies involved and the significant human and time investment they require. These factors can seriously impact the success and acceptance of the approach (Boéchat-Heer & Vallat, 2019; Petit & Bélisle, 2018; Tessaro, 2020).

Figure 1

Schematic Model of the Implementation of the Formative-Assessment ePortfolio for Learning Competencies



Note. Guidance and feedback sessions are highlighted in green. The ePortfolio process runs throughout the second semester of third-year training (January–June). Students receive structured feedback from peers and instructor at designated checkpoints, allowing them to refine and improve each piece before its final validation. The work plan provides clear guidelines, milestone deadlines, and a structured timeline for feedback integration, ensuring a transparent and supportive evaluation process aligned with well-defined validation criteria for each piece.

From the outset, students receive a Dalton-Freinet-inspired work plan (Capitanescu-Benetti et al., 2024) detailing six possible ePortfolio pieces, along with their timelines, implementation guidelines, an informative bibliography, and the competencies to be developed (see Figure 1 for an illustration). Students then select three pieces to complete, deciding whether to work individually or cooperatively. For each piece, students are allowed three attempts, supported by both peer and instructor feedback. Before each submission, they receive peer review as authors and, in turn, provide feedback when acting as reviewers. Discussion sessions offer a space to share progress on pieces and receive guidance, clarifications, and feedback from both peers and the instructor. This aligns with the logic of educational assessment (Cieutat & Connac, 2021), which values interaction, enabling learners to refine their work through clear guidelines, mutual support, time markers, and feedback. The process also allows students to set their own assessment timeline within the designated timeframe for each piece, aligning with the principle of a personalized evaluation schedule (Gremion & Maubant, 2024).

Ongoing support from both the instructor and peers is a cornerstone of our model. The ePortfolio is designed to foster cooperation and engagement through pedagogical scenarios that actively involve all stakeholders at every stage (Petit & Bélisle, 2018). Concretely, the support is operationalized in practice through structured cycles of feedback that alternate between peers and instructors. After a phase of content transmission, students begin drafting a portfolio piece, which they first submit to a peer-review process for horizontal feedback—either during class time or asynchronously through cooperative arrangements such as peer tutoring, mutual aid or guided re-reading (Dabo & Connac, 2022). The revised version is then discussed with the instructor during dedicated guidance sessions, allowing for vertical feedback and clarification. Through these back-and-forth exchanges, learners progressively stabilize both their work and their understanding of expectations. Because each piece can be revised before final validation, support is not occasional but embedded in the temporal architecture of the ePortfolio itself, making feedback a structuring condition of learning rather than a post-hoc correction. In this configuration, assessment becomes part of the

learning process rather than its endpoint (Ferrier, 2024; Ferrier & Connac, 2025a). In this sense, our ePortfolio model is not simply accompanied by feedback: it is built through feedback—through a shift from being evaluated to becoming evaluative of one's own development. Guidance and feedback sessions are highlighted in green in Figure 1, with opportunities for interaction embedded throughout the process.

Within a socioconstructivist framework, educational partners act as guides, while the ePortfolio serves as a tool to support the learning process (Dévé et al., 2009). The goal is to cultivate guided autonomy (Verslype et al., 2017) and support learners in developing self-directed learning skills (Meeus et al., 2006). According to Gremion and Maubant (2024), assessments serve as a powerful synchronizer of learning, and learners' competencies become apparent when they act as their own analysts, evaluating the gap between the expected outcomes of a task and their own performance. Similarly, Roblez (2024) stressed the need to rethink assessment by placing the learner at the center of the process within a situated perspective—in which competence emerges through a situated encounter with a problem—accepting errors not as failures, but as levers for regulation and learning (see also Jonnaert, 2011).

Thus, in our model, assessment acts as a formative tool designed to support the learning process. This is achieved through structured feedback loops while allowing students the flexibility to set their own learning pace by adjusting and selecting the timing of their assessment. Within this framework, mistakes are not failures but opportunities for regulation and improvement without causing discouragement and disengagement (Cieutat & Connac, 2021).

The work plan clarifies the expected learning outcomes by specifying each developed competency, the work process, instructions, time sequences, and assessment criteria (see Figure 1 for an illustration). It is systematically presented, serving as a checkpoint for progress and an opportunity to clarify expectations. This reflects the necessary transparency of the pedagogical contract between stakeholders (Romainville & Fischer, 2020) and underscores the importance of structuring feedback, guidance, and support throughout the entire process (Capitanescu-Benetti et al., 2024). It also corresponds to the idea that, within a curricular training framework, the ePortfolio should reveal implicit aspects and provide learners with a coherent understanding of their academic pathway (Romainville & Fischer, 2020; Tessaro, 2020).

Each piece of the ePortfolio concretely applies themes covered in class, following the course's chronological progression, and serves as a distinct learning and assessment scenarios aligned with expected outcomes. These scenarios include designing and organizing a didactic sequence, developing a pedagogical project, or structuring a cooperative learning activity. Students can accumulate up to 3×5 points throughout the process, based on five criteria per piece (see Figure 1). During the completion phase, they write an introduction and a conclusion, earning the remaining 5 points of the individual assessment, for a total of 20, which is standard in the French academic grading system. Thus, our model involves four types of assessment. The various feedback sequences support formative assessment, self- and peer-assessment, while a certification-based assessment takes place at the end of the process. Additionally, students write a reflective report, which remains unassessed to minimize tensions between personal writing and evaluation—an issue that often hinders the development of reflective skills (Fischer et al., 2020; Fischer & Romainville, 2020; Le Boucher et al., 2019).

Although the ePortfolio can be constructed cooperatively—enabling learners to work together on projects and document their process—its learner-centered nature makes it a unique and individual production: an authentic student-produced work. This framework clearly illustrates the shift from a teaching-centered paradigm to a learning-centered one, shaped by social interactions within a systemic yet personalized approach (Dévé et al., 2009). We have labeled this learning-competencies model as a formative-assessment ePortfolio.

Assessing the Impact of ePortfolios: A Research-Based Perspective

As mentioned earlier, further research is needed to fully grasp the potential of ePortfolios. Despite their growing popularity, systematic studies on their construction process and impact on learners remain scarce. While some recent research has adopted mixed methods (qualitative and quantitative) and hybrid approaches (cross-sectional and longitudinal), findings remain inconsistent (Boéchat-Heer, 2018; Fischer et al., 2020; Fischer & Romainville, 2020; Tessaro, 2020; Verslype et al., 2017). Given the wide variability in how ePortfolios are conceptualized and implemented, greater clarity is needed, and assessing their overall impact remains challenging (Meeus et al., 2006; Tochel et al., 2014; Wade & Yarbrough, 1996; Zeichner & Wray, 2001). A recent meta-analysis illustrates this difficulty: only nine out of 204 studies met the inclusion criteria, yet even among them, methodological differences persisted in research design, ePortfolio types, and implementation (Segaran & Hasim, 2021).

Following these recommendations, we have refined our model and aim to share it with a wider academic community. This will facilitate its adaptation across various training programs and disciplines while ensuring its validation through robust methodologies

Table 1
Overview of the Sequential Mixed-Methods and Hybrid Research Design

Mixed and hybrid methodology	Stages *n* (%)	Procedure	Detail of the procedure
Motivations and non-motivations/ Qualitative Cross-sectional	T0/*n* TOT = 97; NePF = 65 (67%); NonePF = 32 (33%)	Content analysis of the written motivations and non-motivations for choosing (or not) the ePortfolio pathway at the outset	Motivations were collected at the moment students signed the learning contract, in the form of short self-written statements (3–5 lines) explaining their reasons for choosing the ePortfolio. The same procedure was used to gather the motivations for non-choice among students who opted out of the ePortfolio.
Questionnaire Q1–T1/Quantitative cross-sectional	T1 mid-journey / *n* = 34 (52.3%)	A first questionnaire at mid-semester (Q1–T1)	The mid-semester questionnaire (Q1–T1) consisted of 53 items and was administered electronically in early April. It included the four different scales used across the four studies (cognitive, regulatory, cooperative, and professional). At this stage, the longitudinal design of the study was made explicit to participants, who were informed that a second questionnaire (Q2–T2) would be administered at the end of the semester (from late May to mid-June). The instructions clearly stated that the purpose of Q2–T2 was not to verify or reproduce initial answers, but rather to determine whether changes in participants' representations had occurred over time. The Q2–T2 was a slightly adapted version of the initial one and consisted of 57 items. Students were reminded that there were no right or wrong answers, that they were free to express their perceptions openly, and that their responses would remain anonymous with no consequence on their evaluation
Questionnaire Q2–T2/Quantitative cross-sectional	T2 end of course / *n* = 16 (47.1%)	A second Q2–T2 at the end of the semester	
Q1–T1 vs. Q2–T2/ Quantitative longitudinal	T1 vs. T2	Q1–T1 vs. Q2–T2, allowing for both cross-sectional and longitudinal quantitative analysis	
Reflective reports/ Qualitative cross-sectional	T3/*n* = 69 (71%); NonePF = 28 (29%)	A content analysis of the reflective reports produced at ePortfolio completion	The reflective reports written autonomously by students were extracted from all completed ePortfolios. They constitute a full, non-assessed chapter at the end of the ePortfolio.
Interviews/ Qualitative cross-sectional	T4/*n* = 4 (25%)	A content analysis of individual semi-structured interviews conducted after completion of the ePortfolio	Students who had completed all stages of the research process and agreed to further participation were then invited to individual interviews lasting between 45 and 90 minutes.

Note. The design combines cross-sectional and longitudinal approaches across four stages (T0–T4), with the corresponding qualitative and quantitative procedures[1]. All students gave informed consent and were reminded that they could withdraw from the research at any time without justification and without any impact on their academic evaluation.

[1] Because it was not feasible to establish an equivalent control group under authentic teaching conditions, the questionnaires were designed so that each participant served as their own control. Items were therefore designed to allow students to compare the ePortfolio with other assessment modalities they had previously experienced in their university trajectory. Given the conceptual complexity of some constructs, short contextual definitions were provided before the corresponding items to ensure semantic clarity. For example, the item on deep processing (Craik & Lockhart, 1972) was preceded by the following definition: "Deep processing refers to a semantic elaboration of information, as opposed to surface-level processing which attends more to form than meaning." Students were then asked: "Compared with other assessment methods, would you say that working with the ePortfolio fosters deep processing?" Students were already familiar with the key concepts included in the questionnaire, as these had been explicitly addressed in their coursework. Both questionnaires underwent pretesting (clarity, response format, and validity) with similar samples before being finalized. We collected responses on 5-point Likert scales (from 1 to 5) and numerically coded them to compute central tendency and dispersion indicators as well as inferential analyses (ANOVA). We computed chi-square tests from raw frequencies for each response category. A total of 52.3% of students, all novices in the ePortfolio approach, participated in the Q1–T1 questionnaire. This proportion does not differ from random distribution relative to the parent population ($n = 34$, $\chi^2 = 0.14$, $df = 1$, $p = .80$), which reduces the likelihood of initial self-selection bias in favor of the ePortfolio. Of these, 47.1% continued to Q2–T2, a proportion which also does not differ significantly from that expected by chance relative to the Q1–T1 sample ($n = 16$, $\chi^2 = 0.12$, $df = 1$, $p = .80$). ANOVAs we performed both on the raw item data and on the aggregated mean scores of the four scales presented below revealed no significant differences between the two time points (Q1–T1 vs. Q2–T2). The interaction between sub-scale dimensions and temporalities was also non-significant. We therefore retained all participants for subsequent analyses across the studied dimensions, with statistical tests adjusted for sampling variability and respective group sizes. We performed quantitative analyses using raw questionnaire data with both descriptive and inferential statistics (ANOVA and chi-square tests; Howell, 2008). (For detailed results and statistical analyses (including significance testing) for each dimension and sub-dimension, see the four referenced studies.) The interview guide mirrored the dimensions explored in the questionnaires, while allowing for more open-ended and elaborated expression. The interviews were audio-recorded, fully transcribed, and subsequently coded and analyzed. We conducted the qualitative analyses through thematic content analysis based on the extraction of semantic categories from motivations, reflective reports data and verbatim interview data (Bardin, 2013). This mixed analytical approach is consistent with recent methodological recommendations (Daverne-Bailly & Wittorski, 2022).

with a large student cohort. The model has previously been implemented with a large sample of third-year Education Sciences students, with effects observed across cognitive, regulatory, cooperative, and professional dimensions. It was investigated through a mixed and hybrid methodological approach, combining both quantitative and qualitative analyses conducted at different stages of the learning process, in both cross-sectional and longitudinal perspectives. In the field of ePortfolio research, such a mixed and hybrid design is considered essential for capturing its impact (Meeus et al., 2006; Tochel et al., 2014; Zeichner & Wray, 2001). This approach allows for methodological triangulation (Apostolidis, 2006), ensuring that quantitative indicators of change can be meaningfully interpreted considering students' lived experiences and developmental trajectories. Before presenting the promising initial findings derived from four studies, we first outline the common methodological framework used to assess the model. This framework is summarized in Table 1.

Each of the four studies synthesized below drew on a specific subset of these instruments to capture developmental change, combining Likert-scale questionnaire (cross-sectional and longitudinal) measures with qualitative data from students' motivations, reflective reports, and semi-structured interviews. Building on this shared methodological framework, the four studies respectively examine distinct dimensions of the ePortfolio's impact: cognitive processes (Study 1), self-regulation (Study 2), cooperation (Study 3), and professionalization (Study 4).

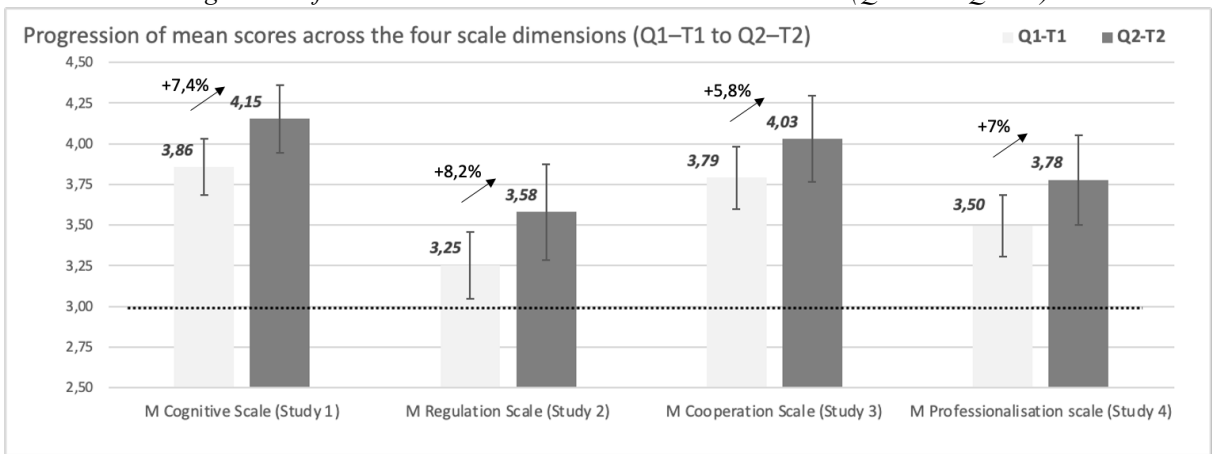
The implementation of the model involved a large cohort of third-year undergraduate Education Sciences students (n = 97, third-year, age M = 21.3, SD = 1.9, 6.2% male). At the outset, 67% of students (n = 65) chose the ePortfolio pathway and justified their choice and motivation during the first lecture (T0). When students were given the option between completing an ePortfolio and taking a summative end-of-semester assessment, they significantly preferred the ePortfolio model (χ^2 = 11.2, df = 1, p < .001). Among these students, 52.3% agreed to participate in a first mid-semester questionnaire Q1–T1 (n = 34, age M = 21.1, SD = 1.8; all female and novices in the ePortfolio approach). A retention rate of 47.1% from this first sample was maintained for Q2–T2 (n = 16). Of this latter group, 25% volunteered for individual end-of-course semi-structured interviews (n = 4; T4), and 100% of the reflective reports were included in the qualitative corpus (T3; see Table 1).

In addition, several students decided to join the ePortfolio pathway later in the semester, bringing the final participation rate to 71% of the cohort (n = 69), further supporting the strong preference for this formative model (χ^2 = 17.33, df = 1, p < .001). This strong preference for the ePortfolio suggests that students perceived it not only as an assessment format, but as a meaningful learning environment.

To make the developmental effects of the ePortfolio visible, the results are presented through a three-layered empirical illustration. First, a global overview of the evolution of mean scores between Q1–T1 and Q2–T2 shows an overall progression across the four learning dimensions (cognitive, regulatory, cooperative, and professionalization; Figure 2).

Figure 2

Progression of Mean Scores Across the Four Scale Dimensions (Q1–T1 to Q2–T2)



Note. All values are reported on a five-point Likert scale (from 1 to 5). The upward trend across time points indicates a developmental reinforcement of perceived cognitive, regulatory, cooperative and professionalization effects. Mean scores above 3.0 reflect positive values, with systematic improvements from T1 to T2 across all four dimensions. Percentage gains are calculated relative to the usable range of the Likert scale (1–5; i.e., Gain% = {raw gain / 4} × 100. Error bars represent the standard error of the mean {SEM}).

Table 2
Mean Scores and Standard Deviations (Q1–T1 vs. Q2–T2) for Each Sub-Dimension of the Four Scales Used Across the Studies (5-Point Likert Scale)

Cognitive scale (Study 1)	Deep processing	Responsibility	Metacognition	Mastery of knowledge	Reflexivity	Self-assessment	Legitimacy	α
Q1–T1	3.82 (± 0.97)	4.03 (± 1.03)	3.76 (± 0.82)	3.71 (± 1.06)	4.38 (± 0.89)	3.71 (± 1.14)	3.59 (± 0.96)	0.84
Q2–T2	4.13 (± 0.62)	4.56 (± 0.63)	3.75 (± 0.68)	4.25 (± 0.68)	4.50 (± 0.52)	3.94 (± 1.34)	3.94 (± 0.85)	0.79
Gains (%)	0.30 (7.5%)	0.53 (13.25%)	-0.01 (-0.25%)	0.54 (13.5%)	0.12 (3%)	0.23 (5.75%)	0.35 (8.75%)	

Regulation scale (Study 2)	Self-efficacy	Motivation	Autonomy	Affect regulation	Self-regulation	Stress regulation	Mental load regulation	α
Q1–T1	3.71 (± 1)	3.56 (± 1.26)	4.12 (± 1.07)	2.74 (± 1.16)	3.29 (± 0.97)	3.12 (± 1.17)	2.24 (± 0.78)	0.82
Q2–T2	3.94 (± 1.06)	3.94 (± 1)	4.5 (± 0.73)	3.38 (± 1.09)	3.63 (± 1.02)	3.50 (± 1.15)	2.19 (± 0.83)	0.81
Gains (%)	0.23 (5.75%)	0.38 (9.5%)	0.38 (9.5%)	0.64 (16%)	0.33 (8.25%)	0.38 (9.5%)	-0.05 (-1.25%)	

Cooperation scale (Study 3)	Tool-mediated collaboration	Perceived proximity to peers	Peer support and peer feedback	Perceived proximity to the instructor	Self-assessment supported by peer feedback	Coherence between learning and assessment	Recommendations for implementation	α
Q1–T1	4.03 (± 0.94)	3.91 (± 1)	3.7 (± 1.1)	3.06 (± 1.25)	3.71 (± 1.14)	4.21 (± 1.15)	3.94 (± 0.98)	0.87
Q2–T2	4.31 (± 0.95)	3.63 (± 1.2)	4.06 (± 0.77)	3.25 (± 1.73)	3.94 (± 1.34)	4.75 (± 0.45)	4.25 (± 0.68)	0.75
Gains (%)	0.28 (7%)	-0.29 (-7.25%)	0.37 (9.25%)	0.19 (4.75%)	0.23 (5.75%)	0.54 (13.5%)	0.31 (7.75%)	

Professionalizatio n scale (Study 4)	Professional identity	Career projection	Professional integration	Perceived proximity to the future profession	Perceived proximity to future colleagues	Belief in one's future professional integration	Mastery of professional strategies	α
Q1–T1	3.68 (± 1.12)	3.97 (± 1)	3.32 (± 1.07)	3.91 (± 1.16)	3.18 (± 0.90)	3.12 (± 1.07)	3.29 (± 1.17)	0.89
Q2–T2	4.19 (± 1.11)	4.19 (± 1.11)	3.56 (± 1.31)	4.13 (± 1.02)	3.31 (± 1.08)	3.50 (± 1.10)	3.56 (± 0.73)	0.91
Gains (%)	0.51 (12.75%)	0.22 (5.5%)	0.24 (6%)	0.21 (5.25%)	0.14 (3.5%)	0.38 (9.5%)	0.27 (6.75%)	

Note. Gains indicate the observed developmental change over time, and Cronbach's α values confirm the internal consistency of each scale. Percentage gains are calculated relative to the usable range of the Likert scale (1–5; i.e., Gain% = {raw gain / 4} × 100).

Second, a finer-grained analysis of each sub-dimension within these scales specifies where change occurred and to what extent (Table 2). Finally, selected verbatim excerpts collected at different stages of the process (T0, T3, and T4) illustrate the lived experience underlying these quantitative gains, showing how students progressively internalized cognitive, regulatory, collaborative, and professional dimensions (Appendix B). Taken together, these three layers of evidence provide a triangulated understanding of the impact of the ePortfolio, rather than relying on isolated indicators.

Our first study explores how the ePortfolio model fosters cognitive learning dimensions by structuring feedback loops that support "learners' organizational closure" (study 1). This process helps students refine their work based on perceived learning outcomes and their own actions. Key cognitive dimensions—reflexivity, responsibility in learning, mastery in knowledge construction, deep information processing, and self-assessment—are reinforced. Reflective reports and interviews highlight additional gains in knowledge embodiment, long-term memorization, metacognition, feeling of legitimacy, and meaning attribution. Feedback emerges as a crucial factor, enabling error analysis, clarifying expectations, and guiding adjustments. Regular checkpoints and clear timelines further support engagement throughout the process (Ferrier, 2024; Ferrier & Connac, 2024c).

Our second study highlights how the model fosters self-regulated learning (study 2). Findings show positive effects on autonomy, self-efficacy, motivation, and stress adjustment, with affect regulation displaying the greatest improvement. Although the workload remains sustained, stress regulation improves over time, suggesting that increased cognitive engagement does not translate into increased emotional strain. As students internalize the ePortfolio process, they gain autonomy, control, and agency. Feedback, guidance, and meaningful learning experiences support this adjustment. Positive emotions, including enjoyment and self-confidence, emerge through key ePortfolio features such as support, feedback, error understanding, and planning (Ferrier & Connac, n.d., 2023, 2025b).

Our third study examines the social dimension of learning (study 3). Quantitative results show a positive evolution in cooperation throughout the process, particularly in perceived alignment between training and assessment, the ePortfolio's collaborative potential,

the quality of support, and its recommended use. These effects do not seem to depend on students' perceived closeness to peers or the instructor, but rather on the structural features of the ePortfolio itself. Qualitative findings reinforce these trends, highlighting its role in fostering cohesion, cooperative learning, knowledge co-construction, mutual support, and active engagement. However, organizational challenges related to group work dynamics remain (Ferrier, in press; Ferrier & Connac, 2024a, 2024b).

Our fourth study explores the professionalization dimensions (study 4). Findings show that students reinforce their professionalization process and professional choice throughout the process. The most significant benefits emerge in professional projection and proximity to their future profession, with the strongest progression observed in the construction of their professional identity. Qualitative data further highlight the ePortfolio as a concrete tool for preparing for professional practice, enhancing engagement and commitment. It also clarifies learning expectations and their practical implications, fostering an integrative view of competencies as transferable to professional contexts. The model also supports the development and internalization of professional attitudes and ethics (Ferrier & Connac, 2025a).

Finally, we conducted a comprehensive review of ePortfolio models, analyzing their impacts while positioning our own, and providing a detailed account of each step along with the associated pedagogical documents. Findings showed that the model helps students identify their acquired competencies and supports their transferability, while also being highly valued by students, who intend to apply it in their future learning and teaching practices (Ferrier & Connac, 2026).

Limitations

The limitations of our model have been discussed in the studies, with the most critical being the need for strong support during the initial weeks of ePortfolio implementation to help students adopt the self-directed learner posture it requires.

Another limitation of our model concerns its implementation context. While it was initially developed within the field of Education Sciences, its effectiveness lies in its core features, making it potentially transferable to other training programs and academic settings. Its formative, competency-based approach seems easily adaptable across disciplines, provided the same theoretical framework is maintained. This potential for transferability is supported by similar ePortfolio models successfully applied in fields such as Second Language Learning (Abrar-ul-Hassan et al., 2021), Cross-disciplinary inquiry-based learning (Mueller & Bair, 2018), and Archaeology and Art History (Verslype et al., 2017), although outcomes related to self-evaluation, reflective thinking, engagement, and autonomy remain inconclusive. More broadly, ePortfolios are now used across a wide range of disciplines—from Social Sciences to Technical Engineering (Le Boucher et al., 2019; Lu, 2021; Segaran & Hasim, 2021). However, the diversity of models and implementation contexts still makes it difficult to generalize their impact (Segaran & Hasim, 2021; Tochel et al., 2014).

Lastly, transitioning from traditional lectures and certification-based assessments to an ePortfolio approach entails a workload for all stakeholders. Nevertheless, as Meeus et al. (2006) pointed out "Going through an ePortfolio is certainly labour intensive . . . but this is also true of the other tools" (p.133) and other practices.

Beyond these limitations, it is important to note that participation in the ePortfolio was voluntary rather than mandatory. Despite its significantly higher workload, 71% of third-year students ultimately completed the formative-assessment ePortfolio rather than the summative end-of-course test—a choice they justified with statements such as: "That's what students are looking for today . . . we should have the same thing everywhere."

With this article, our goal was to clearly present our model and share it to facilitate its transferability and encourage its application, allowing other researchers and practitioners to assess its impact. This, in turn, will help refine and improve the model.

Future Directions

The conclusions established by our studies could be extended in several directions. Beyond the documented gains, several limits and unanswered questions emerged from the implementation of the model. A first research direction concerns the durability of the effects: while the results show short-term developmental reinforcement, it remains unclear whether these benefits persist over time or translate into situated professional practice after graduation. A second avenue relates to the conditions of equitable cooperation, as some students reported asymmetries in engagement and responsibility within peer interactions, suggesting that this dimension may require additional scaffolding. A third unresolved question concerns the transferability of the model: further studies are needed to examine whether similar effects would be observed across other disciplines, academic levels, pedagogical cultures or instructors—and to what extent the model retains its formative value beyond its original context. A fourth limitation concerns the costs of engagement (cognitive load, time, regulation efforts), which merit deeper investigation to better understand how guidance can be optimized without reducing learner agency. Finally, the statistical power of the present findings

remains constrained by sample attrition between T1, T2 and T4; replication with larger cohorts is needed to consolidate effect tendencies and test the robustness of developmental trajectories.

To address these questions, future research could mobilize longitudinal designs and diversified methodologies, including larger and more heterogeneous samples, to determine whether the ePortfolio functions as a temporary learning accelerator or as a structurally transformative practice. It would also be relevant to explore additional outcomes, such as the development of prosocial competencies or long-term transfer once students enter professional life, and to broaden the scope of inquiry to test the adaptability of the model in other institutional and cultural settings.

Conclusion: Toward a Meaningful Integration of ePortfolios

By situating ePortfolios within a clear conceptual framework rooted in socioconstructivist, cognitivist, and systemic perspectives, we argue that they are not universally suited to all educational contexts. To move beyond their romanticized image or common pitfalls—such as technological challenges, tensions, or rejection—greater conceptual clarity and further research are needed to avoid reducing ePortfolios to a passing trend in alternative assessment. Future research should further examine how our model operates across different assessment cultures, particularly outside the Francophone context, to determine whether the developmental gains documented here are context-dependent or transferable across institutional ecologies.

When well-designed and grounded in theory, ePortfolios can foster reflective thinking, deep and self-directed learning, along with greater responsibility and engagement. They support both formative and summative assessment, including peer and self-assessment, and offer a meaningful alternative to one-shot, certification-based tests. Yet, simply labeling a tool as an ePortfolio does not guarantee its effectiveness.

For successful implementation, three key conditions must be met: (a) a clearly defined pedagogical design, (b) structured support through regular feedback loops, and (c) flexibility to encourage adoption and integration. One of the main strengths of our model lies in its adaptability, enabling it to align with diverse pedagogical objectives while maintaining a strong formative-assessment focus within a well-defined theoretical framework.

By presenting our formative-assessment ePortfolio model for learning competencies, we aim to contribute to the need for clarity while providing empirical insights into its impact. Our goal is to share it with researchers and practitioners for further testing and critical analysis. Future research should therefore explore its application in greater depth to refine its formalization.

To conclude, ePortfolios must be firmly anchored in psychopedagogy, as their full potential can only be realized within a structured framework. Therefore, we emphasize that a well-designed framework must be the alpha and omega of any ePortfolio experience, guiding it from inception to completion.

Ultimately, our model also constitutes a call for epistemic awareness: in teaching Education Sciences, we are not merely transmitting knowledge about education but enacting it in practice—just as teaching Cognitive Psychology mobilizes applied cognitive psychology in action. From this perspective, we aim to move ePortfolio discourse from enthusiasm and hype toward a grounded psychopedagogical framework.

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Appendix A
Portfolio Engagement and Pedagogical Contract

This contract is a formal component of the pedagogical process. It is presented to students after the initial explanation of the model to ensure informed commitment and clarity of expectations.

PORTFOLIO ENGAGEMENT CONTRACT

First name: _____ Last name: _____

How to construct a portfolio piece: (several answers possible)
☐ Clearly explain what you intend to produce
☐ Demonstrate what you are able to accomplish
☐ Draw on the course content and readings
☐ Follow the instructions and assessment criteria
☐ Have the piece proofread by another student

What must be included in a portfolio piece: (several answers possible)
☐ The first and last names of the author(s)
☐ The first and last name of the peer reviewer
☐ Your hobbies or personal interests
☐ Your phone number
☐ The bibliographical references used
☐ Your personal opinion of the course
☐ Your professional project

How should a portfolio piece be submitted for evaluation? (one answer only)
☐ By email
☐ By postal mail or deposited in XXX
☐ On the university MOODLE platform (ENT)

How many times can a portfolio piece be revised? (one answer only)
☐ None – the first evaluation is final
☐ Twice, with an explanation of what has been revised
☐ Twice, without explanation of revisions
☐ As many times as desired

What must the final portfolio contain? (one answer only)
☐ All drafted pieces + introduction + conclusion
☐ Only validated pieces + introduction + conclusion
☐ Whatever the student chooses

What motivates me to complete a portfolio? *(Student's personal motivation – open response)*

I commit to attending all classes (except in cases of force majeure): ☐ YES ☐ NO
I understand that the average correction time for a portfolio piece is one week: ☐ YES ☐ NO
I am aware that feedback on portfolio pieces is provided only during lectures and tutorials: ☐ YES ☐ NO

Signature:

Appendix B

Developmental Progression Illustrated Through Excerpts From Verbatim Statements

Stage	Cognitive dimensions (Study 1)	Regulation dimensions (Study 2)	Cooperation dimensions (Study 3)	Professionalization dimensions (Study 4)
Motivations (T0)	"I find the portfolio interesting because it is something we work on continuously throughout the semester. I feel more confident because the work is checked along the way. I also find it more relevant, since the other type of exam would help me retain much less of the content" (Student 17); "This project interests me because it gives meaning to the course, unlike standard test questions" (Student 35).			
Non-motivations (T0)	"For the sake of simplicity, I chose the other modality. . . . The ongoing assessment system implied by the portfolio does not really suit me. I prefer having a single evaluation at the end of the semester" (Student 2).			
Reflective reports (T3)	"a fascinating experience involving constant reflection and continuous learning. The possibility of having several attempts allowed for deeper thinking in order to better meet expectations. . . . It is much more than a simple assignment—it is a completely different kind of construction and reflection" (Student 61); "an opportunity to reflect on one's own work, to take a step back and identify one's strengths and weaknesses. . . . It fosters autonomy and engagement, as I was actively involved in selecting and organising my own work" (Student 66).	"This work gave us the possibility to fail without stress or pressure because we can improve our work thanks to feedback, without feeling discouraged" (Student 15); "I was very anxious about this portfolio at first—it seemed vague and I didn't really understand what was expected. But once I started the first piece and submitted it for the first time, I began to understand how it worked. I really enjoyed creating it and seeing it take shape piece by piece" (Student 62).	"We chose to work as a pair, but this didn't prevent us from also talking with other students who were working on the same pieces and reviewing their work. It was interesting to see which ideas we had in common, which ones differed, and how each of us implemented them depending on our educational project" (Student 31); "It was thanks to cooperation that I was able to open myself to other perspectives, new ideas, and areas for improvement that I would not have identified on my own" (Student 50).	"This portfolio was a genuine tool for both professional and personal development. Some of the pieces were surprisingly useful during my admission interviews for graduate schools. It also allowed me to put myself in the position of a professional—it creates immersion by asking us to design processes or projects that an actual practitioner would carry out" (Student 18); "This portfolio really helped me project myself into my future role as a teacher. It led me to create and present concrete elements of the profession, such as a classroom plan or a teaching project" (Student 39).
Interviews (T4)	"You become really invested in it. . . . It's not something you just memorise by heart. . . . The portfolio actually makes sense. . . . There is more reflection—you're really 200% inside the process. . . . With the feedback we can learn from our mistakes and act on them, so they stop being mistakes and become strengths." (Student 22); "certain qualities need to be mobilised—concentration, attention. . . . You really have to be 100% present . . . and process the information in depth. . . . Yes, there is a real awareness, a questioning of one's work, . . . checking if everything is coherent and understandable. . . . It is alive, . . . lasting—a form of 'living knowledge'. . . . It is an activity of trying to understand. . . . You are responsible for the progress of your work and for its quality" (Student 15).	"To be honest, the first piece was very difficult . . . because it was new, . . . everything felt very unclear. . . . You need time to adapt. . . . I think I didn't understand the approach at first because I didn't understand what was really expected. . . . But we were encouraged to try again and we had several chances—nine in total for three pieces, . . . which is actually a lot. . . . Of course, there can still be a bit of stress, . . . but I didn't experience it negatively—quite the opposite. I really invested myself 100%. . . . You can build self-confidence and self-esteem quite easily, because once you understand the approach and the course content and you use them as intended, really internalizing the process, it becomes very beneficial. . . . It's almost impossible to end up with a negative outcome. . . . Yes, it takes time—like any real learning, . . . but it's not rote memorization, and that's what makes the workload, even if it is substantial, not become a barrier. . . . In the end, you reuse what you've learned" (Student 47).	"It's a collaborative task—you're working individually but also as part of a group. . . . You need to agree on the substance of the work. . . . What is valuable in collaboration is that I might think I've understood something, and then my peers tell me 'No, look, that's not it,' and they help me correct it. . . . There are very positive aspects—at first there is real motivation because you share competencies and know-how—but also negative aspects related to how people work and their level of commitment. We are not all equal in terms of responsibility. . . . So, I have mixed feelings about peer collaboration. . . . That's where the portfolio also shows its limits. . . . Several values are needed for it to work—including empathy, because you need to understand what the other person feels if you don't do your part. And also, punctuality, consistency" (Student 15); "The portfolio really becomes a collective construction—still individually authored but nourished by shared moments where we exchange and review each other's pieces. . . . The required peer review and discussion phases help enormously. I have carefully proofread pieces for others, and I think that helped them too. . . . As a group, we make more progress than when working alone. . . . It is essential because if you stay too long in the dark, you can get stuck, whereas working in a group helps you move forward" (Student 47).	"It also reflects what society expects. . . . It even made me realise that being a project coordinator could be a path for me, . . . it really fit who I am. . . . It made me think about it seriously. . . . Or even becoming an instructional designer to build training programs. . . . I told myself: this might actually be something I'd be interested in. It opened up career perspectives I had not previously considered." (Student 15); "I could really project myself into the profession. . . . You feel almost ready to enter the world of work. . . . It clearly helps you start forming a professional identity. . . . It's really about taking on the professional posture. . . . You already feel almost like a teacher in training. It helps us build our identity as professionals. . . . It's more representative of what we will actually be doing. . . . Now that I have completed the portfolio, I'm glad I did it because it has already been useful to me, . . . and it will be useful later as well. . . . The portfolio approach creates a link between three moments: the present (as I'm working on a piece), my existing experience, and the future professional context. . . . It will really help me in practice—it's the kind of learning that stays with you. It's truly theory preparing for practice. I think I'll keep it for at least the next five years and refer back to it" (Student 47).

Note. Excerpts were collected at different stages of the research (T0, T3, and T4). This table maps student discourse onto the four assessed dimensions (cognitive, regulatory, cooperative, and professionalization). The excerpts illustrate (1) initial motivations or non-motivations at entry (T0)[1], (2) reflective meaning-making during portfolio completion (T3), and (3) the internalization of competencies and identity-related shifts expressed in post-hoc interviews (T4). Taken together, they provide qualitative evidence of the developmental trajectory fostered by the ePortfolio process.

[1] At the end of the course, 29% of students (n = 28) did not choose the ePortfolio and 14.3% (n = 4) agreed to provide a written explanation for their non-choice.

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Reflective ePortfolios Support Personal and Professional Growth in Pre-Nursing Students

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The use of electronic portfolios (ePortfolios) in education has become increasingly popular as a tool for documenting and managing learning. Initially designed as simple repositories, ePortfolios have evolved into platforms that encourage critical thinking and reflection, benefiting both personal growth and career preparation. In this study, we explore student perceptions of reflective ePortfolios in three pre-nursing science courses: Anatomy & Physiology I (API), Anatomy & Physiology II (APII), and Microbiology. Through these courses, students used ePortfolios to track academic progress, reflect on their learning experiences, and develop digital communication skills. We also examine how students view ePortfolios as a learning tool and a means to enhance career readiness. While ePortfolios are recognized for fostering self-awareness, professional development, and promoting a digital identity, it is crucial to assess student engagement and willingness to continue using them after graduation. The findings show that over 80% of students valued the personal growth and creativity ePortfolios provided, yet only 60% felt that instructor feedback improved their work. Many students also raised concerns about the workload involved. Although two-thirds of students recommended ePortfolios for future courses, less than 60% planned to use them postgraduation. We highlight the need for increased integration of ePortfolios into career development to sustain long-term engagement.

Many systems have been used to collect, organize, and preserve educational materials for future use. In recent years electronic portfolios (ePortfolios) have gained popularity to digitally preserve materials for various purposes. Jenson and Treuer (2014) defined an ePortfolio as a tool for documenting and managing one's own learning over a lifetime in ways that foster deep and continuous learning. The definition of ePortfolios has evolved from just a simple depository of artifacts like a large electronic file cabinet to a highly organized social network system where critical thinking is promoted and seen as a tool for authentic assessment (Robnolt et al., 2017). Several educators have defined the ePortfolio as a course management tool or a learning platform (Likhushina & Radchenko, 2021; Olstad, 2020) while others have viewed it primarily as a space for creating a virtual identity (Jenson & Treuer, 2014).

Watson et al. (2016) has recognized ePortfolio as a high-impact practice due to its potential to produce self-directed learners and autonomous thinkers through critical thinking and active learning experiences. ePortfolios are designed within an academic framework where students critically reflect on their learning and professional aspirations under faculty guidance. With ePortfolios, students work individually and collaboratively to develop and preserve academic and nonacademic artifacts including coursework, skills, interests, and accomplishments. ePortfolios also provide a platform where students can demonstrate abilities through multiple modes and technologies to potential employers or recruitment agencies (Panyukova, 2020; Reese & Levy, 2009; Simatele, 2015; Watson et al., 2016). Due to the significant value that ePortfolios provide to students as a skills and career enhancement tool, many academic programs are eager to implement them as part of their curriculum to increase student success (Cooney et al., 2020; Meeus et al., 2006; Pospíšilová & Rohlíková, 2023). ePortfolios have been used for multiple reasons in higher education. Slepcevic-Zach and Stock (2018) utilized a classification by Baumgartner (2009) in which ePortfolios are divided into the following three types:

- Development portfolio: "students include work completed early and late in the program so that development can be judged" (University of Hawai'i at Mānoa, n.d., section 4).
- Presentation portfolio: "Students select and submit their best work. The showcase portfolio emphasizes the products of learning" (University of Hawai'i at Mānoa, n.d., section 1; Samardzija & Balaban, 2014).
- Reflection portfolio: "a collection of evidence that attests to achievement as well as personal and professional development through critical analysis and self-reflection" (Pandya et al., 2017, p. 78).

Pandya et al. (2017) observed that reflective portfolios promoted self-awareness and critical thinking skills for students and enabled faculty to provide feedback on

students' application of academic learning to professional practice. This type of portfolio enables students to reflect on their learning and personal growth and to document skills and experiences during their academic career.

Academic institutions commonly use reflective ePortfolios in capstone courses (Goertzen et al., 2016; Harver et al., 2019). Holdsworth et al. (2009) suggested that a capstone course is defined as a bridge between knowledge and knowledge integration. For example, students in a senior-level internship course apply newly acquired knowledge from multiple courses to the internship environment. Senior-level capstone experiences allow students to learn new material as they are in the internship; it is the reflection on those experiences that truly enables them to create new knowledge (Kolb & Kolb, 2005). ePortfolio activities in capstone courses allow students to capture, organize, demonstrate, and reflect on their previous learning in various forms usually done at the end of their academic journey just prior to graduation (Goertzen et al., 2016). However, ePortfolios can also enable students to learn to portray themselves professionally, academically, and personally earlier in their academic careers. For example, pre-service teacher education students use ePortfolios to document their technology competency (Lim et al., 2016), reflections upon working in the classroom, and as a repository for documents relevant to their eventual teaching.

The AAC&U report *How College Contributes to Workforce Success: Employer Views on What Matters Most* (Finley, 2021) found that while college graduates are becoming more effective at communicating their achievements to employers, they need more practice at this skill. An ePortfolio can be used as a learning tool to support a student transition from student to professional by giving them practice early and often in the development of articulating their accomplishments. In completing the assignments, students learn to formally introduce themselves to potential schools or employers, identify appropriate artifacts that can demonstrate their skills and experiences, and reflect on those skills and experiences in the moment. Instead of waiting until the end of the academic journey to try to recall what they have accomplished, building an ePortfolio along the way allows students to regularly and on a consistent basis, collect reflections, artifacts, awards, recognitions, or experiences gained in different classes.

ePortfolio activities introduced early in their academic careers through multiple courses may present more opportunities for students to reflect on their learning and how their experiences relate to their career goals, while providing documentation of their accomplishments through reflection and artifacts (Mohammed et al., 2015; Rossi et al., 2008). Thus, we sought to determine students' perceptions of the use of reflective ePortfolios across three courses within a pre-nursing course of study leading up to the application to nursing school.

Methods

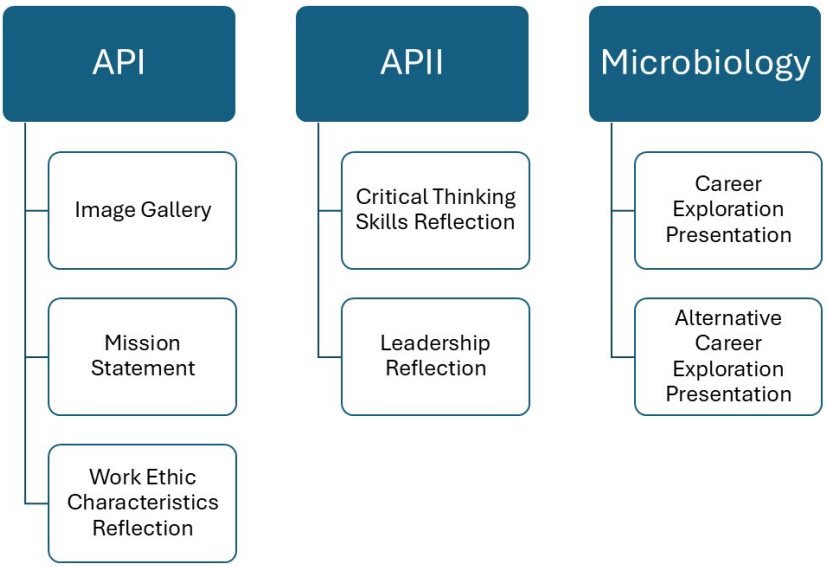
We asked students to complete ePortfolio assignments in three pre-nursing science courses (Anatomy & Physiology I [API], Anatomy & Physiology II [APII], and Foundations of Microbiology [Microbiology]) based on evidence from a pilot study by several faculty for each course. In API, three faculty participated across three semesters (Spring 2023, Fall 2023, and Spring 2024) for a total of 19 sections (397 total students which was 49% of the total sections across the three semesters). In APII, two faculty participated across three semesters (Spring 2023, Fall 2023, and Spring 2024) for a total of eight sections (273 total students) (28% of the total sections across the three semesters). In Microbiology, three faculty participated across three semesters (Spring 2023, Fall 2023, and Spring 2024) for a total of 11 sections (376 total students) (48% of the total sections across the three semesters). At this institution, each section is capped at 24 students.

Prior to starting the project, we gave students information on the benefits of ePortfolios, how to access the ePortfolio electronic platform and the specific assignments pertaining to each course. We used Watermark Student Learning & Licensure as the electronic platform for the ePortfolios in the courses. The grade weight for each ePortfolio assignment was at the discretion of the section faculty and ranged from 5% to 7.5% of the final course grade.

We provided a template for the ePortfolio, which included pages for each course. Given that only certain sections of each course participated in this study, not all students in APII and/or Microbiology had assignments from the previous course. We designed the ePortfolio template to be flexible, allowing students to start with any of the three courses. While it did not require initiation at a specific starting point, all pages and assignments were accessible, enabling students to begin where needed. If students desired, they could complete any previous pages but were not required to do so within a specific course.

At the end of each semester, we asked students to complete a Qualtrics electronic survey. In the survey, we asked students whether they consented to participate in this study which was approved by the college's institutional review board. We asked those students who consented to participate for academic-related information including career aspiration, expected course grade, and previous experience with ePortfolios. Furthermore, we asked students to reflect over the ePortfolio experience assigned within their specific course for that semester and answer the following questions based on a disagree, neither, or agree Likert scale; additionally, we included two free-response reflective questions. Table 1 contains an itemized list of the questions and their respective survey response scales.

Figure 1
Flowchart Demonstrating Specific Pages of the ePortfolio Done as Assignments Within Each Course



Note. API = Anatomy & Physiology I course; APII = Anatomy & Physiology II course; Microbiology = Foundations of Microbiology course.

Assignments Description per Course

We developed ePortfolio assignments to reflect on experiences obtained across five pillars (critical thinking, career exploration, communication, leadership, connection) for success in healthcare professions. Each course had unique assignments (Figure 1) which when combined represented a complete ePortfolio. We considered each ePortfolio assignment a page in the Watermark Student Learning & Licensure electronic ePortfolio template. Assignment details per course are presented below in Tables 2, 3, and 4.

Data Analysis

We collected data during three consecutive semesters (Spring 2023, Fall 2023, and Spring 2024) and combined them to obtain frequency counts for each statement in the Qualtrics electronic survey. We then created figures in Microsoft Excel using percentage data representing percentage responses of disagree, neither, or agree for each statement and summarized qualitative data by theme.

Results

A total of 246 API students (62% of the total possible students enrolled in the 19 sections which participated in the ePortfolio project), 183 APII students (67% of the total possible students enrolled in the eight sections which participated in the ePortfolio project), and 252 Microbiology students (67% of the total possible students enrolled in the 11 sections which participated in the ePortfolio project) responded to the electronic survey.

When asked about having previously completed an ePortfolio, the API students reported YES less frequently than the other courses for each semester, but the number of students responding YES to this question increased as the project continued, from 32% during Spring 2023 to 54% during Spring 2024. In the APII and Microbiology courses, the YES response increased by semester as well from 38% during Spring 2023 to 76% during Spring 2024 for APII and 48% during Spring 2023 to 65% during Spring 2024 for Microbiology (Figure 2).

Consistently across all three courses, over 80% of the students said that they knew what an ePortfolio was (Table 1, Question 7) and the instructions were clear (Table 1, Question 1) across all courses (Figure 3). The students in API and APII were evenly distributed in their response to the amount of workload (Table 1, Question 2) with approximately a third agreeing that the workload was too much, a third neither agreeing or disagreeing, and a third disagreeing that the workload was too much. Only in the Microbiology course did greater than 50% of the students disagree that the workload was too much (Figure 3). Only 16% of Microbiology students agreed that the workload was too much.

Figure 2

Change in Previous ePortfolio Exposure Across Semesters and Courses



Note. API = Anatomy & Physiology I course; APII = Anatomy & Physiology II course; Micro = Foundations of Microbiology course.

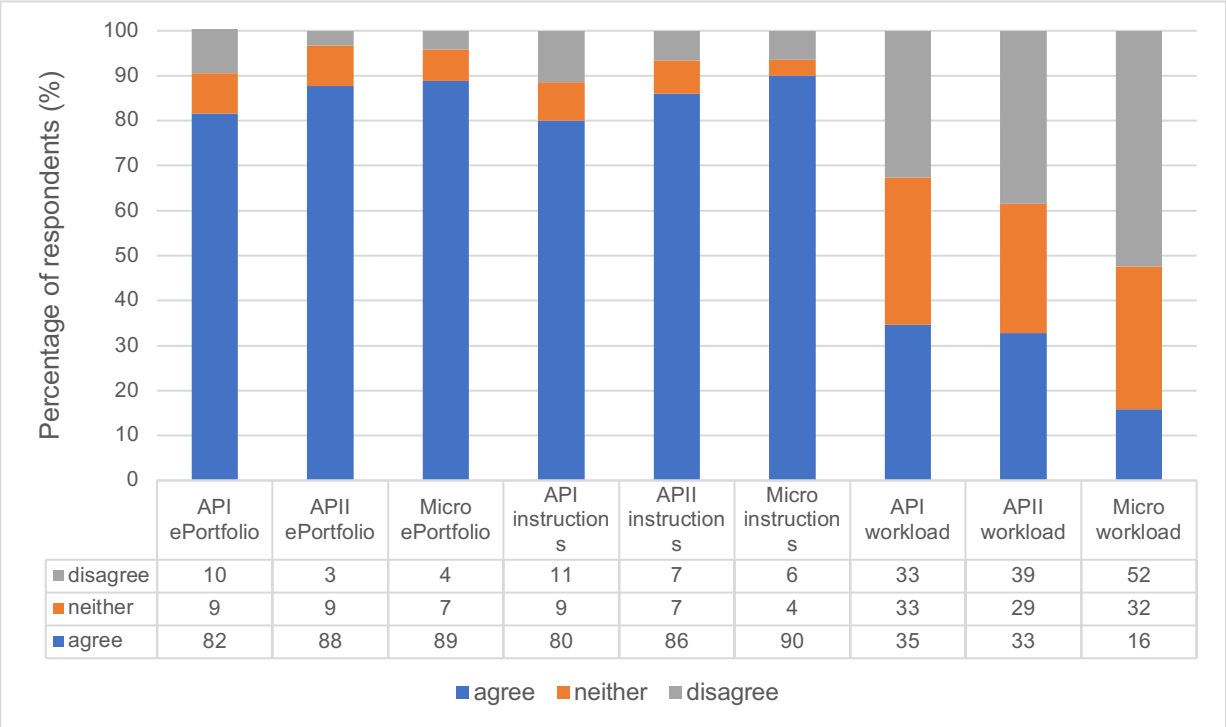
Table 1

Survey Items Assessing Perceptions of the ePortfolio Experience

Question no.	Survey statement	Response scale
1	The instructions for each page were clear.	1 = *disagree*, 2 = *neither*, 3 = *agree*
2	The workload for the pages was too much.	1 = *disagree*, 2 = *neither*, 3 = *agree*
3	The pages allowed me to be creative.	1 = *disagree*, 2 = *neither*, 3 = *agree*
4	The pages allowed me to demonstrate personal growth.	1 = *disagree*, 2 = *neither*, 3 = *agree*
5	The pages allowed me to demonstrate professional growth.	1 = *disagree*, 2 = *neither*, 3 = *agree*
6	The feedback I received helped me to improve the pages for the future.	1 = *disagree*, 2 = *neither*, 3 = *agree*
7	I know what an ePortfolio is.	1 = *disagree*, 2 = *neither*, 3 = *agree*
8	I see the benefits of an ePortfolio to enhance my digital communication skills to highlight my achievements.	1 = *disagree*, 2 = *neither*, 3 = *agree*
9	I plan to continue to use my ePortfolio in the future.	1 = *disagree*, 2 = *neither*, 3 = *agree*
10	I recommend this activity for future classes.	1 = *disagree*, 2 = *neither*, 3 = *agree*
11	Reflect on some things that you learned about yourself by doing the ePortfolio project in this class.	Open-ended response
12	(Microbiology only): During the course of this assignment, did your perception of your career choice change? If so, how?	Open-ended response

Figure 3

Percentage of Respondents Across Courses for the Questions 7, 1, and 2



	API ePortfolio	APII ePortfolio	Micro ePortfolio	API instructions	APII instructions	Micro instructions	API workload	APII workload	Micro workload
disagree	10	3	4	11	7	6	33	39	52
neither	9	9	7	9	7	4	33	29	32
agree	82	88	89	80	86	90	35	33	16

Note. The full text of the questions follows: ePortfolio = I know what an ePortfolio is (Question 7); instructions = The instructions for each page were clear (Question 1); workload = The workload for the pages was too much (Question 2). API = Anatomy & Physiology I course; APII = Anatomy & Physiology II course; Micro = Foundations of Microbiology course.

Students across all three courses reported that the ePortfolio pages allowed them to be creative (Table 1, Question 3; 72% averaged across the three courses of all three semesters) and demonstrate growth personally (Table 1, Question 4; 79% averaged across the three courses of all three semesters) or professionally (Table 1, Question 5; 80% averaged across the three courses of all three semesters), although the average for API was consistently lower than for APII and Microbiology (Figure 4). Students increasingly reported that the ePortfolio pages enhanced their digital communication skills (Table 1, Question 8; 59% for API, 75% for APII, and 82% for Micro; Figure 4).

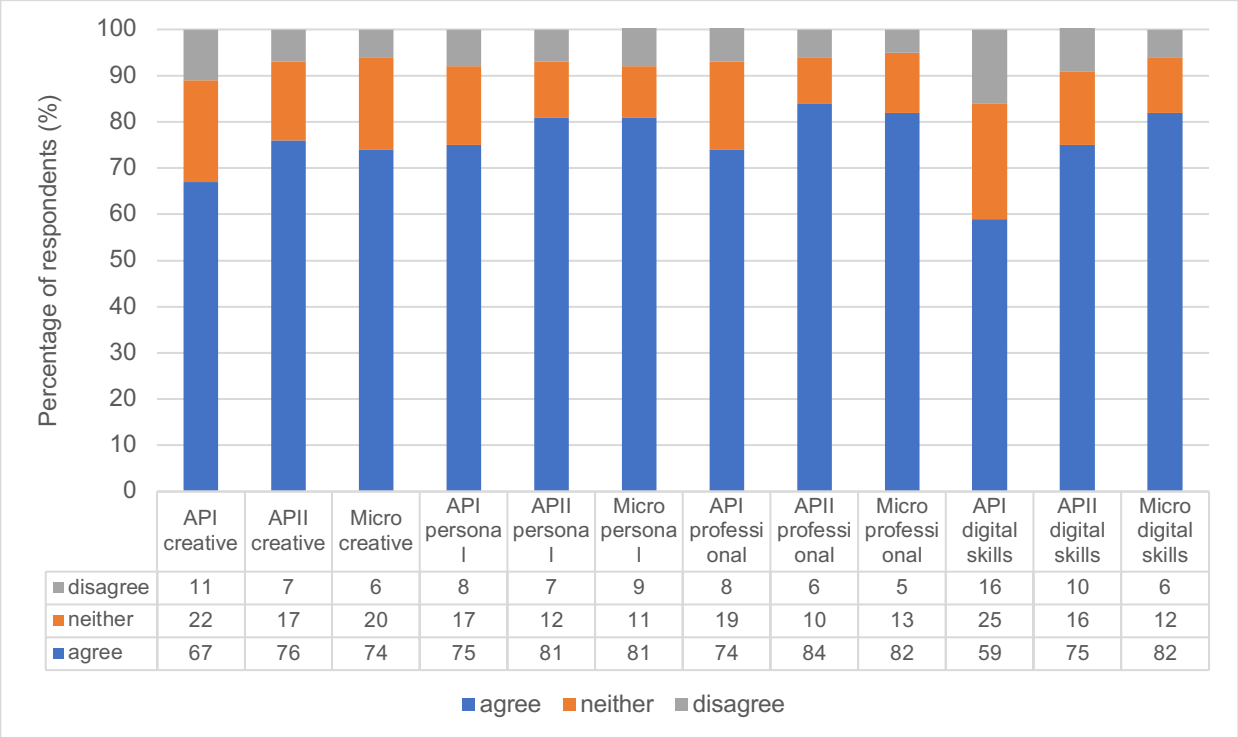
Fewer than 60% of students, averaged across all three courses of all three semesters (59%), reported that the feedback given by instructors helped them improve the pages for the future (Question 6; Figure 5), although fewer API (53%) students agreed than APII (63%) and Microbiology (64%) students. Two-thirds of the students (when averaged across all three courses) reported that they recommended the assignment be used in future classes (Table 1, Question 9) and approximately 60% of the students (when averaged across all three courses) reported that they themselves planned to continue to use the ePortfolio in the future (Figure 5).

Students were asked to reflect on the open-ended question: "Reflect on some things that you learned about yourself by doing the ePortfolio project in this class" (Table 1, Question 11). While a few students expressed concerns about the project's impact on their time for course material, most responses across all three courses were positive. Students highlighted valuable insights about themselves, including personal growth, achievements, and a deeper understanding of their learning journey.

Students in API (Table 2) provided positive comments on the development of a resume and the realization that to be competitive, more accomplishments would need to be on the resume. Students commented that they learned how to write about themselves and that it helped with self-confidence when speaking about themselves in a professional setting. Overall, the comments reflected the theme of learning to articulate their successes and accomplishments and focusing on where they needed to enhance their skills, accomplishments, and mission to be competitive. One student noted, "it gave me the opportunity to sit and reminisce on my 'why'," which summarized the most common student response. A subset of respondents, however, felt that the assignments

Figure 4

Percentage of Respondents Across Courses for Questions 3, 4, 5, and 8



	API creative	APII creative	Micro creative	API personal	APII personal	Micro personal	API professional	APII professional	Micro professional	API digital skills	APII digital skills	Micro digital skills
disagree	11	7	6	8	7	9	8	6	5	16	10	6
neither	22	17	20	17	12	11	19	10	13	25	16	12
agree	67	76	74	75	81	81	74	84	82	59	75	82

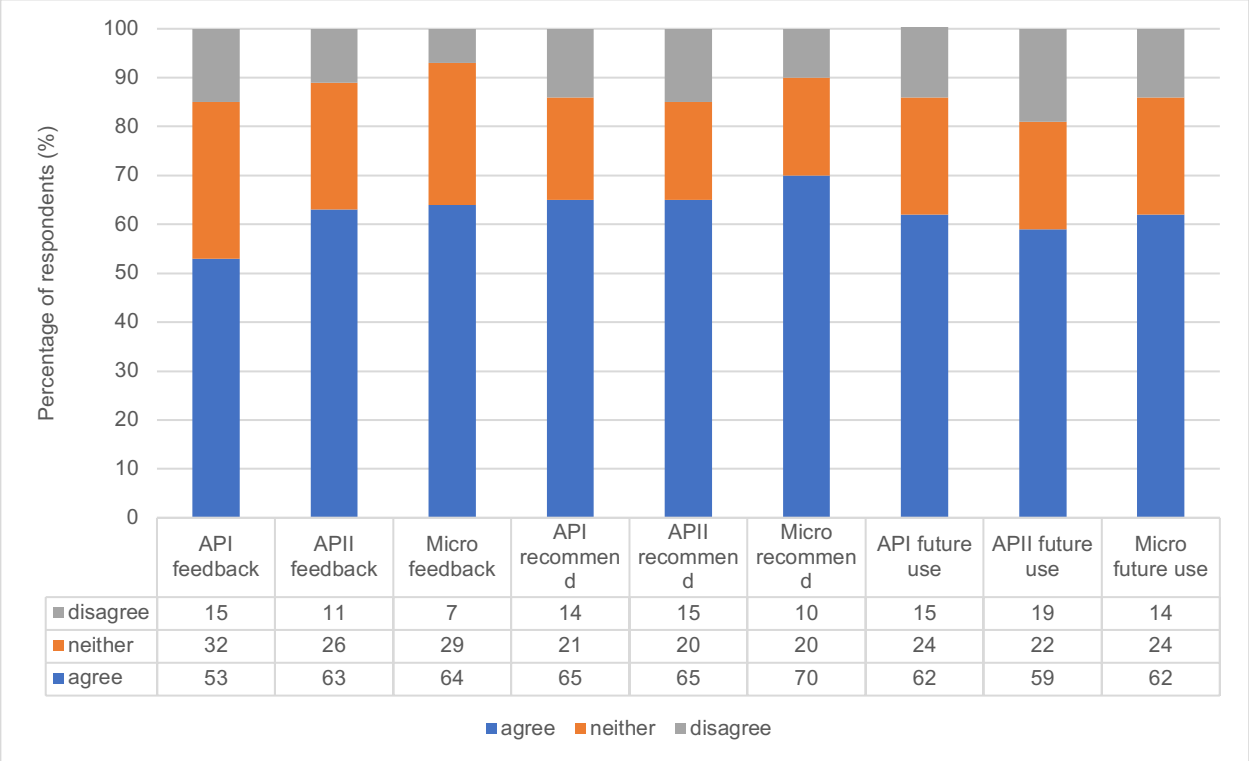
Note. The full text of the questions follows: creative = The pages allowed me to be creative (Question 3); personal = The pages allowed me to demonstrate personal growth (Question 4); professional = The pages allowed me to demonstrate professional growth (Question 5); digital skills = I see the benefits of an ePortfolio to enhance my digital communication skills to highlight my achievements (Question 8). API = Anatomy & Physiology I course; APII = Anatomy & Physiology II course; Micro = Foundations of Microbiology course.

Table 2

Anatomy and Physiology I ePortfolio Assignment Pages

Page no.	Page title	Brief description
1	Introductory page	Students created a picture gallery of up to six professionally appropriate pictures to introduce themselves (e.g., family, pets, hobbies, educational goals) and wrote a description of what the pictures meant to them.
2	Mission statement page	Students wrote a well-constructed paragraph essay (approximately 1–2 pages) describing life experiences and/or people that shaped their personal and/or professional philosophy, using guiding questions: • Who are the people who have the most influence in your life? • Why did you choose your major? • What are your strengths related to school? • What do you want to do with your degree? • How has personal experience influenced your desire to go into your chosen profession? • What challenges have you faced to get to where you are?
2	Mission statement page cont.	Do you have any specific quotes that are important to you or explain your personal mission statement?
3	Work ethic characteristics page	Students reflected on work ethic characteristics (e.g., reliability and dependability, dedication to a task, productivity, cooperation, self-discipline, initiative) by providing written descriptions and supporting artifacts.

Figure 5
Percentage of Respondents Across Courses for Questions 6 and 9



	API feedback	APII feedback	Micro feedback	API recommend	APII recommend	Micro recommend	API future use	APII future use	Micro future use
disagree	15	11	7	14	15	10	15	19	14
neither	32	26	29	21	20	20	24	22	24
agree	53	63	64	65	65	70	62	59	62

Note. The full text of the questions follows: feedback = The feedback I received helped me to improve the pages for the future (Question 6); recommend = I recommend this activity for future classes (Question 9); digital skills = I see the benefits of an ePortfolio to enhance my digital communication skills to highlight my achievements. API = Anatomy & Physiology I course; APII = Anatomy & Physiology II course; Micro = Foundations of Microbiology course.

took away from time spent on course materials and did not provide anything for them, indicating that some students did not have a personal interest in the ePortfolio and did not see the value as a career tool.

Students in APII (Table 3) reaffirmed this finding with comments noting the difficulty in identifying essential skills to improve as well as the challenge in writing about themselves and their accomplishments. It should be noted that some students recognized through the exercise that they had accomplished more than they had thought. Additionally, it gave them the opportunity to reflect on leadership and critical thinking skills as well as further developing writing skills.

Students in Microbiology commented that they "still were uncomfortable 'bragging' about self" but did learn how their interests, strengths, and/or challenges matched their career choices (Table 4). The comments focused on how the ePortfolio pages either solidified career choices or enabled them to recognize that there may be other career choices that they had not considered previously. One student noted, "I am thankful for the careers project we did. It was very helpful in me exploring other career options and helped me find an alternate path that I want to take in my career." In fact, this "thankfulness" was a common theme. The comments also indicated that students recognized they had learned valuable skills from academic courses that are necessary for their careers

Discussion

By completing an ePortfolio in the pre-nursing program, students actively engaged in their personal growth by demonstrating their individual creativity and prowess in digital communication skills. We contribute to the ePortfolio literature by extending prior single-course implementations, demonstrating how intentionally scaffolded ePortfolio practices across multiple sequential courses promote student persistence through sustained engagement and reflective development, while also supporting preparation for future employment and professional school applications.

Although this ePortfolio was initiated in the API course, many students reported having completed an ePortfolio previously, indicating that students were already familiar with an ePortfolio. Most students found it easy to complete an ePortfolio, with over 80% stating that the instructions were clear. From Fall 2023 to

Table 3
Anatomy and Physiology II ePortfolio Assignment Pages

Page no.	Page title	Attitude/element	Brief description
4	Critical thinking page*	Analysis	Students described and provided artifacts showing how they gather, understand, and interpret data and other information.
4	Critical thinking page cont.	Inference	Students described and provided artifacts showing how they draw conclusions based on relevant data, information, and personal knowledge and experience.
4	Critical thinking page cont.	Problem solving	Students described and provided artifacts showing how they gather, analyze, and communicate information to identify and troubleshoot solutions.
4	Critical thinking page cont.	Independence of thought	Students described and provided artifacts demonstrating open-minded examination of beliefs under new evidence and awareness of how prejudices, social pressures, and habits may affect professional judgment.
4	Critical thinking page cont.	Integrity	Students described awareness of the limits of their own knowledge and how they respond when they do not know something.
4	Critical thinking page cont.	Perseverance	Students described and provided artifacts illustrating resistance to choosing quick, simple answers to avoid uncomfortable situations.
5	Leadership page	—	Students provided written descriptions and artifacts of what leadership meant to them, considering formal and informal leadership positions, leaders they admired, and leadership skills or positions they aspired to obtain.

Note. *Based on the National League for Nursing Accreditation Commission attitudes that foster critical thinking (Berman et al., 2015).

Table 4
Microbiology ePortfolio Assignment Pages

Page no.	Page title	Brief description
6	Career exploration page	Students investigated requirements for their professional goals (e.g., prerequisite courses, observation and volunteer hours, interviews), curated a list of key websites (schools, companies, professional organizations), drafted a personal statement, and reflected on backup plans.
7	Alternative health-related career plan page	Students investigated two alternative healthcare careers, completed a report sheet for each (salary, work environment, educational requirements, personal strengths and challenges), and created a PowerPoint presentation on one career to share findings with the class.

Spring 2024, there was an increasing number of students who used ePortfolios, as many students in APII and microbiology had already completed one in API or other courses. As new programs introduce ePortfolios into the curriculum, such as the Introduction to Computing course that most students complete in the first year, familiarity will increase at our institution.

In assessing student perceptions of ePortfolios, Gerbic et al. (2009) reported that the greatest challenge was the use of technology. Birks et al. (2016) also demonstrated that health science students did not see the ePortfolios as a positive experience due to dissatisfaction from practical and technical challenges. However, Muin et al. (2021) did not observe these issues; rather 81% of the respondents agreed that the ePortfolios were easy to use and that they were "able to use [the software] independently after the first instructions" (p. 501). We found that over 80% of students reported that the instructions were clear and the majority saw "benefits of an ePortfolio to enhance my digital communication skills to highlight my achievements" (59% in API, 75% in APII, and 82% in Micro). It is possible that with the increased opportunities for online activities during and following the COVID pandemic, students feel much more comfortable with learning and using online platforms.

Gopika and Rekha (2023) observed that students' digital learning usage and knowledge of digital learning increased following the COVID-19 outbreak significantly in Indian school children. Many schools started to depend on e-learning technologies and tools after the COVID-19 outbreak (Qiao et al., 2021), and ePortfolio use was following that trend during the outbreak (Fabriz et al., 2021) and after the pandemic.

Additionally, as ePortfolios become more of a norm, students may view them more positively as shown by Gerbic et al. (2011) where the negativity of ePortfolios decreased over time in undergraduate Education students. Gerbic et al. (2011) also recommended embedding ePortfolios early in academic programs to get students acculturated to their use. This may explain the increased positive perceptions, especially in benefits for digital communication and recommendation for future classes since we used ePortfolios over a three-course sequence and over three semesters of data.

For courses that participated in this project, laboratory notebooks and catalogues were used to document projects as indicated by Avraamidou and Zembal-Saul (2002), who defined a portfolio as a portable case for carrying a loose collection of papers and materials. Students in the pre-nursing program moved from having the burden of carrying bags of heavy papers to a digitalized collection of their artifacts to show their best work using a web-based interface.

Many students request letters of recommendation from the faculty for their nursing program applications. These letters are usually based on the faculty personal or mentoring relationship with the student. With the ePortfolio, it would be easy for any faculty member to consult a requester's ePortfolio and write based on the work done during the entire academic journey. It allows faculty to see concrete examples of the student's work, such as research projects, built models, presentations, and reflections, which can help them write a more detailed and personalized recommendation.

While reflective and presentation ePortfolios are often completed as part of a capstone course or capstone project, their integration and use throughout a course of study is gaining interest (Morreale et al., 2017). We assigned portions of the ePortfolio in three prerequisite courses for nursing programs that are usually taken in sequence. Students who have been exposed to an ePortfolio before taking API are consciously aware of their academic development as it is happening to allow them to perform according to their academic goals. Based on our most recent survey data, at least half (54% of API students in Spring 2024) of our respondents can build from previous courses because they have already developed an ePortfolio. Instead of waiting until the end of their academic experience to recall all the work done during the last few years, students learn to document the knowledge and skills they develop as the experiences occur, building the ePortfolio as they progress through their course of studies, with the presumptive intention to continue archiving artifacts as evidence of additional skill development.

As Ciesielkiewicz (2019) pointed out, an ePortfolio can be utilized as (a) a learning tool, (b) assessment in the classroom in lieu of standardized tests and for program-wide assessment as well as in the professional setting for "standards of performance & competency" (Strivens et al., 2009, p. 652), and (c) a tool for career development and employment. In this study, we focused the ePortfolio on the latter utilization as it was designed to provide students with pages that will be used for professional school and/or job applications. In surveying students' perceptions of the ePortfolio, Ciesielkiewicz (2019) found that the highest ratings (51% very true, 5% true of me, 6% somewhat true of me) were observed when asked, "I believe that this activity could help me in my professional career and help me do a better job" (p. 658). No student answered negatively to this question. We also asked students about using ePortfolios in the future. Favorable scores were approximately similar (65% for API, 59% for APII, and 61% for Microbiology) to those reported by Ciesielkiewicz (2019), but a subset of students in our study disagreed with the statement (15% for API, 19% for APII, and 10% for Microbiology) whereas Ciesielkiewicz (2019) found no students disagreed.

Bolliger and Shepherd (2010) and Lin (2008) observed benefits around the learning processes and validated benefits of ePortfolios in support of reflection which is fundamental to the construction of knowledge. By completing pages about a mission statement, critical thinking skills, and leadership qualities, students evaluated their progress by focusing on their strengths and challenges. Students in our survey seemed to appreciate the tracking process—they recognized personal and professional growth exhibited through the reflection pieces in the ePortfolio within all three courses. This growth was particularly evident in the qualitative comments that students made regarding what they learned about themselves by building the ePortfolios. For example, students reflected that they learned how to write about themselves and that it helped with self-confidence when speaking about themselves in a professional setting. Muin et al. (2021) observed positive benefits of ePortfolios as well related to increasing motivation and self-efficacy.

Because ePortfolios are used to catalogue learning experiences and career skills, students are encouraged to continue using their ePortfolios beyond their academic experience, with many factors contributing to the persistence of using it (Thibodeaux et al., 2017). While our students surveyed felt the assignments allowed them to demonstrate personal and professional

growth (79% and 81% averaged across all three courses, respectively), students saw less value in persistent use of ePortfolios, with 65% recommending the assignment be used in future courses and only 60% responding that they planned to continue using the ePortfolio in the future. These results suggest that there is a disconnect between the value that students perceive in using the ePortfolio and their desire to continue using the ePortfolio or recommending the assignment to others. One recommendation for continued use and promoted value, as ePortfolios become more commonplace within the overall curriculum, would be utilization of ePortfolios in upper division (3000/4000 level) courses prior to capstone experiences.

Thibodeaux et al. (2017) investigated factors that contributed to discontinued use of ePortfolios. The top reasons for discontinued use were (1) time, (2) personal interest, (3) ePortfolio management system, (4) choice of platform, and (5) proprietary availability. In comparing our data to Thibodeaux et al. (2017), most of our respondents saw value in the time utilized to produce ePortfolios. A subset of our respondents, however, did feel that the assignments took away from time spent on course materials and did not provide anything for them, indicating that some students did not have a personal interest in the ePortfolio and did not see the value as a career tool. While Thibodeaux et al. (2017) found that the ePortfolio management system can be both a factor for continued or discontinued use, our program did not allow for any choice in ePortfolio management system. Overall, the SL&L system instructions did not seem to be a barrier (over 80% across all three courses agreed that the instructions were "easy to use"). Ways to further promote the ePortfolio management system could include additional tutorials or handouts that describe how to edit the ePortfolio and/or incentivize personalization as part of the assignment. Thibodeaux et al. (2017) found that students desired more guidance on how the ePortfolio can be used beyond the online Educational Technology Leadership master's program and its application to their lives. Our results suggest that increased instruction and focus on applicability in their professional growth may enhance students' perception of continued use and value. In addition to providing guidance on the future ePortfolio management system, graduates' interest can be enhanced by providing a variety of discreet professional and personal possibilities for use of the ePortfolio post-course completion. In this work, we used SL&L as the only platform, and students will continue to have access to this platform if the institution maintains the subscription which includes postgraduation access. Enhancing personal interest, and allowing more personalization, as well as consistent feedback could promote more student buy-in and enhance student perceptions of continuing ePortfolio use in the future. In our study, 59% of respondents felt "the feedback [they] received helped [them] to improve the pages for the future," suggesting that improving consistent and helpful feedback across all courses may be one avenue to increasing persistent use.

Conclusion and Recommendations

We investigated student perception on the use of reflective ePortfolios across three pre-nursing science courses. Most respondents found value in ePortfolio assignments, appreciated the ability to demonstrate creativity, document personal and professional growth, and enhance digital communication skills. However, a minority did not recommend the assignment for future classes and did not plan to continue using them after graduation. Our proposed recommendations include ways to increase student perception on how ePortfolios can be used as part of their career advancement before and after graduation.

Creating a continuous need and value for students to update and return to their ePortfolios is essential to maintain engagement. Presenting the benefits of the ePortfolio system to students in a more significant way and developing assignments that allow ease of use as a professional tool will encourage student motivation to continue using their ePortfolio. Students should be encouraged to discuss the ePortfolio with a mentor, and it could be included as part of the assignments. This continued engagement could also be achieved by requiring an ePortfolio for various activities, such as job applications, internships, and clinical placements. Additionally, to promote awareness, faculty members should be encouraged to request ePortfolio links when writing letters of recommendation, and this requirement should be included in course syllabi to promote its use among students.

Future studies should examine whether and why students persisted in using their ePortfolio by surveying alumni. Additionally, revisions to the ePortfolio template focusing more on learned skills necessary for professional schools and/or employment may provide increased persistence in the use of ePortfolios. The use of social media as a platform for ePortfolios may also warrant further investigation, given the rise in social media use amongst college students. Lastly, the use of ePortfolios by professional schools and/or employers may drive future student persistence as well.

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Asked You to Write It Down for Me: Integrating Core Knowledge and Critical Thinking Through ePortfolio in Engineering Writing

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In this study, we explore the integration of core disciplinary knowledge and critical thinking (CT) using ePortfolios in undergraduate engineering education. Leveraging a framework adapted from Pierce et al. (2014), we developed the CORE-CT Grid, an assessment matrix to guide and evaluate student learning in an undergraduate engineering course with writing-intensive and CT-based learning outcomes. Through a case study of one first-year engineering student's ePortfolio, we examined how structured reflection prompts and the CORE-CT Grid supported the development of disciplinary knowledge and CT across assignments. Two primary themes emerged, illustrating how ePortfolios can move students from personal/general engagement to relational/specific understanding.

Educators often feel caught between two seemingly mutually exclusive decisions: teach students core disciplinary knowledge, or teach them critical thinking (CT), a "cognitive skill related to rational judgment" (Tahira & Haider, 2019, p. 3) that can be demonstrated through students' faculties to "identify issues and assumptions, recognise important relationships, make correct inferences, evaluate evidence or authority, and deduce conclusions" (Tsui, 2002, p. 743). Despite such a decision feeling like a zero-sum game, research has suggested that educators can, and should, treat the decision as interdependent. For instance, scholars studying learning transfer, such as Driscoll and Wells (2012), Wardle (2007), and Yancey et al. (2014), have argued that metacognition (i.e., thinking about thinking), a foundational component of CT, facilitates the learning of disciplinary content (Flavell, 1979; Kuhn, 1999). In fact, in one writing program, instructors observed that regular reflective discussions—questions like "Why did you do this assignment?" and "How might you use this skill in other courses or beyond college?"—prompted students to make explicit links between class activities and broader learning, even sharing personal examples (Jenson, 2011, p. 54). In this study, Jenson (2011) reported that carefully designed reflection tasks helped first-year students reframe their learning: "Instead of viewing assignments in isolation, students began connecting writing strategies learned in their English course to other classes and life situations" (p. 56).

Portfolios and ePortfolios, the "digitization of print portfolios" (Torres & McKinley, 2023, p. 1), allow students to collect artifact-based evidence of their learning and organize it in a dedicated print and/or digital space (Alexiou & Paraskeva, 2019; Gearhart & Wolf, 1997; Jenson, 2011). When students assemble textual artifacts of their learning and reflect on the artifacts they assembled—why they selected specific artifacts and how those artifacts evidence their learning—they practice metacognitive awareness, offering opportunities for knowledge transfer (Yancey, 2017).

Knowledge transfer is especially vital in the engineering discipline. Engineering students must gain core disciplinary knowledge—encompassing technical competencies, theoretical foundations, and procedural fluency—and apply it at the highest level to protect human life. Eliciting core knowledge in students comes with challenges, though, as STEM faculty frequently report feeling pressure to "cover content," which can limit time spent on broader processes such as CT (Henderson & Dancy, 2007, p. 020102; Hora, 2014). Simultaneously, a growing concern exists among employers about the readiness of graduates to apply knowledge in complex, real-world scenarios (Association of American Colleges and Universities [AAC&U], 2018; National Association of Colleges and Employers [NACE], 2019). Reports from AAC&U (2018) and NACE (2019) have highlighted perceived deficits in skills that employers desire, such as CT, ethical judgment, oral communication, self-motivation, written communication, and real-world application of skills and knowledge. Internalizing such perceptions as instructors, and feeling the need to help students develop these skills, can add further pressure to faculty and curriculum designers in their quest to adhere to content coverage at the expense of CT. Given these challenges, we wondered how ePortfolios, when supported by a structured assessment matrix, could scaffold student development in both domains. More specifically, how might ePortfolios aid engineering students in metacognitive awareness and help them transfer knowledge and skills from one context to another, better preparing them for their future careers?

Pedagogical frameworks, such as Webb's (1997) Depth of Knowledge, and Fink's (2003) Taxonomy of Significant Learning, have emphasized the importance of reflection, integration, and self-awareness in achieving higher-order learning outcomes. Portfolios activate reflection to promote integrative learning and knowledge transfer (Yancey, 2017, 2023). When students assemble artifacts from diverse courses and reflect on them together, they practice making

knowledge connections. In fact, Buyarski and Landis (2014) found that in ePortfolios for a first-year seminar, students often displayed "evidence of learning meeting more than one outcome" (p. 53). Chen and Penny Light (2010) similarly argued that ePortfolios help "promote deep learning and knowledge transfer by fostering the student's ability to make connections between . . . learning experiences in a variety of classroom, workplace, and community settings" (p. 37). Consistent with this knowledge, Yancey (2023) reported that students who were asked to reflect on an internship within their portfolio explicitly noted how that experience affected multiple contexts—professional, academic, personal, and civic—and found meaning "through multiplicity" (p. 18), seeing links across classroom learning, internship tasks, and future goals. ePortfolios give students a space to assemble and compare their experiences, which research has shown strengthens transfer (Torres & McKinley, 2023; Yancey, 2017, 2023).

In this article, we explore the integration of core disciplinary knowledge and CT using ePortfolios in undergraduate engineering education. Leveraging a framework adapted from Pierce et al. (2014), we discuss the development of our assessment matrix, the CORE-CT Grid, to guide and evaluate student learning in an undergraduate engineering course with writing-intensive and CT-based learning outcomes. Through a case study of one first-year engineering student's ePortfolio, we examine how structured reflection prompts and a rubric-style matrix supported the development of disciplinary knowledge and CT across assignments. Resulting knowledge from the current study helps readers see the potential of ePortfolios and their role in facilitating growth from accurate but limited disciplinary-related reflections to sophisticated and metacognitive disciplinary insights, adding to existing literature on ePortfolios and how they aid in transfer of knowledge and skills. The following section details the framework we drew from to design and eventually assess student learning in the examined undergraduate engineering course.

Framework Development

The framework for assessment in the current study was based on the EFFECTs model, developed at the University of South Carolina (Pierce et al., 2014), which integrates technical and professional engineering skills, combining employer expectations from internship databases, ABET accreditation criteria, and evidence-based learning outcomes for CT. The adapted CORE-CT Grid (Figure 1) used in the present study defines levels of:

- Core knowledge (ranging from vague to sophisticated); and
- CT (unreflective, reflective, and metacognitive).

The EFFECTs framework was developed for use in engineering classes to "develop critical thinking skills, collaborative teamwork skills and improv[e] the transfer of core knowledge in engineering classes" (Caicedo et al., 2008, para. 1). Depth of core disciplinary knowledge and the ability to critically think about solutions tend to be related (Caicedo et al., 2008). Thus, the purpose of the EFFECTs framework is to simultaneously promote students' core disciplinary knowledge, as well as their engineering judgments.

Engineering judgment, which goes "beyond the development of a solution," is "a product of critical thinking regarding the appropriateness of the solution" (Huynh et al., 2013, p. 2); this judgment can be challenging to teach and assess. Huynh et al. (2013) suggested that engineering judgment can be promoted with clear benchmarks for how students should appraise solutions. When students direct their learning toward clear benchmarks, with a goal of self-assessment of their learning (e.g., their ability to critically think about solutions), they are engaging in co-regulatory learning, a process in which students actively seek and apply feedback to advance their learning (Andrade & Brookhart, 2021; Torres, 2022). Ample research supports the use of rubrics to facilitate co-regulatory learning, so the CORE-CT Grid extends the EFFECTs framework to support students and educators in formative assessment.

That said, rubrics certainly deserve criticism when they are used in ways that reduce teaching and learning to isolated elements, divorced from their relational meaning. What this criticism rightly points out is that learning is not just the sum of its parts. As Andrade and Brookhart (2021) contended, learning is inherently relational, which is why the authors offer co-regulatory learning as an extension of the more individualistic self-regulated learning. Rather than "teacher-centered" or "student-centered" decisions—like "content" versus "critical thinking"—we can, instead, examine the complex interactions that support learning. When rubrics are designed to reflect relational elements within a learning process, Gotch (2022) contended that they can also improve educators' assessment literacy, the ability to fluently assess student learning in various situations using a variety of available methods. Like engineering judgment, assessment literacy goes beyond instructional solutions to thinking critically about the appropriateness of a solution. Students and educators benefit from rubrics that promote co-regulatory learning and emphasize complex interactions between elements in the learning environment.

Like the EFFECTs framework, the CORE-CT Grid is centered on a driving question (i.e., a design problem) and teaches the student the core knowledge and CT necessary to create and evaluate a working solution for that design problem. In between steps, the students

Figure 1
The Adapted CORE-CT Grid

Core	CT	*Unreflective*	*Novice*	*Reflective*	*Metacognitive*
	Vague	Discusses disciplinary concepts but without specific details, terms, or connections to previous experience or evidence.	Draws a general conclusion with many misconceptions from at least one observation. Connects observation to previous experience or cited evidence.	Draws a general conclusion with many misconceptions from multiple observations. Provides valid reasoning for the conclusion. Makes multiple connections with previous experience and cited evidence.	Draws a well-supported but still general conclusion with many misconceptions from multiple observations. Explains how connections with previous experiences and cited evidence may predict future situations.
	Inaccurate	Discusses assignment-related concepts but with only one or two specific details, terms, or connections to previous experience or evidence.	Draws a general conclusion, even with more than three misconceptions, from at least one observation. Connects observation to previous experience or cited evidence.	Draws a general conclusion, even with more than three misconceptions, from multiple observations. Provides valid reasoning for the conclusion. Makes multiple connections with previous experience and cited evidence.	Draws a well-supported, but still general, conclusion with more than three misconceptions from multiple observations. Explains how connections with previous experiences and cited evidence may predict future situations.
	Accurate	Discusses instructional concepts using mostly specific details, terms, or connections to previous experience or evidence.	Draws a general conclusion, with only one or two misconceptions, from at least one observation. Connects observation to previous experience or cited evidence.	Draws a general conclusion, with only one or two misconceptions, from multiple observations. Provides valid reasoning for the conclusion. Makes multiple connections with previous experience and cited evidence.	Draws a well-supported, but still general, conclusion with only one or two misconceptions from multiple observations. Explains how connections with previous experiences and cited evidence may predict future situations.
	Sophisticated	Discusses engineering concepts using specific details, terms, or connections to previous experience or evidence.	Draws a specific conclusion from at least one observation. Connects observation to previous experience or cited evidence.	Draws a specific conclusion from multiple observations. Provides valid reasoning for the conclusion. Makes multiple connections with previous experience and cited evidence.	Draws a well-supported, specifically stated, conclusion without any misconceptions from multiple observations. Explains how connections with previous experiences and cited evidence may predict future situations.

Note. Adapted from Pierce et al. (2014).

engage in reflective journaling, in which they synthesize the material presented in the previous block of instruction and how the material affects their current solution to the design problem. EFFECTs are designed for two to five instructional periods and have been used in geotechnical, environmental, and structural engineering, among other branches. The resultant product is a final design report where students use and reflect on the experimental learning, core knowledge, and CT they have developed during the EFFECT (Huynh et al., 2013).

While the EFFECTs framework predates the widespread adoption of ePortfolios, its focus on reflective writing made the rubric developed for it a great fit, especially as improvements in effective communication were some of the principal benefits found from using the EFFECTs framework (Pierce et al., 2014). In fact, awareness and self-identification of learning were cited in one of the stated goals of the journaling, as the rubric was developed so instructors could "provide formative feedback on the worksheets

and journals" and so students could "collate [the] information into a measurement of self-learning that [was] documented in the final report" (Pierce et al., 2013, p. 289). The EFFECTs framework is consistent with Andrade's (2001) findings that "simply handing out and explaining instructional rubrics can increase students' knowledge of the criteria for writing as communicated by the rubric, but that translating that knowledge into actual writing is more demanding" (p. 8). The holistic nature of the CORE-CT Grid illustrates the importance of translating knowledge dimensions into writing.

As meaningful development in engineering judgment requires core knowledge and CT attainment (Pierce et al., 2013), the CORE-CT Grid draws from the EFFECTs framework for multilayered assessment (Facione & Facione, 1994). Each cell of the matrix contains detailed descriptors, allowing students and instructors to evaluate thinking across multiple assignments—a key reason why we chose the EFFECTs model for this study.

The next section describes the Methods applied throughout the present study to aid future researchers in replicability and/or expansion of our current work. The section also details case study research, helping to justify our decision to present an analysis of one class participant in the present study.

Methods

Study Focus, Research Questions, and Course Context

In the current study, we investigate how structured reflection prompts and the CORE-CT Grid supported engineering students in developing core knowledge and CT across assignments. We also consider how asking engineering students to create, organize, and publish ePortfolios that feature artifacts of their learning and reflective memos that speak to their learning processes might aid them in transfer. Given these foci, we posed the following research questions:

1. How might structured reflection prompts and the CORE-CT Grid support engineering students in:
    a. Developing core knowledge and CT across assignments?
    b. Transferring core knowledge and CT across assignments?
2. What can those studying the role of ePortfolios in the classroom learn about teaching and assessing the related development of core knowledge and CT?

To answer these research questions, we focused on a first-year engineering course at Quinnipiac University, The World of an Engineer (ENR 110). This course, taken by students in the fall semester, emphasizes design-based group projects, writing-intensive assignments, and team-based learning, engaging students in exercises involving CT, ethical judgment, oral communication, written communication, and real-world application of skills and knowledge.

ENR 110 also requires students to develop, revise, and publish an ePortfolio by the end of the semester; this ePortfolio includes artifactual evidence of their learning throughout the course, combined with reflective memos. To create the memos, students are instructed to reflect on how the artifacts included in their ENR 110 ePortfolio capture moments of their learning and to identify and detail disciplinary concepts that were realized by working on certain class assignments. The aim of the reflective memos is to engage students in metacognitive processes, ideally leading students to realize how what they learned and applied in ENR 110 could be called upon and used in other contexts. Given the aims of the course and the ePortfolio expectations, we felt investigating ENR 110 students' ePortfolios could offer insights about the development of students' disciplinary knowledge and CT across assignments, offering clues about potential learning transfer.

Participant Recruitment

After securing Institutional Review Board (IRB) approval to conduct the current study at Quinnipiac University, our research assistant asked students at the start of ENR 110 whether they would be interested in allowing us to examine their ePortfolios after the completion of the semester. Students were informed of the study's aims and of the significance of the ePortfolio they would create by the end of ENR 110. Students were then provided IRB-approved consent forms, where they indicated their decision to allow or not allow their ENR 110 ePortfolios to be examined by us after the semester concluded.

The Consenting Participant, Case Study Research, and Justification for a Single-Case Design

One ENR 110 student, Juliana Webster, consented to the study, offering her ePortfolio for investigation. Given that we had one consenting participant, methodologically, we settled on a case study approach. Case research, or case study, involves "a scientific method to derive explanations of organizational phenomena" (Bhattacherjee, 2012, p. 93). Explanations offered about the phenomenon of focus are rich, detailed, and contextualized, especially when exploring the phenomenon longitudinally. As argued by Bhattacherjee (2012), the case study approach is particularly well suited to:

> exploratory studies for discovering relevant constructs in areas where theory building [is] at the formative stages, for studies where the experiences of participants and context of actions are critical, and for studies aimed at understanding complex, temporal processes (why and how of a phenomenon) rather than factors or causes. (p. 94)

Additionally, a single-case design is appropriate if "the situation is unique or extreme, if it is revelatory (i.e., the situation was previously inaccessible for scientific investigation), or if it represents a critical or contrary case for testing a well-formulated theory" (Bhattacherjee, 2012, p. 94). Given the one consenting participant and our desire to work toward theory building about the development of core knowledge and CT, ePortfolios, and knowledge transfer, a case study approach was well suited for our study.

Data Collection and Analysis

At the end of the fall semester, Ms. Webster submitted her ENR 110 ePortfolio in a password-protected repository site, overseen by our research assistant. Once grades were submitted, we began reading and analyzing Ms. Webster's ePortfolio.

First, to familiarize ourselves with Ms. Webster's ePortfolio and to identify the artifacts submitted for analysis, we each read her work separately, which included:

- A reflection on disciplinary core knowledge;
- A piece exploring writing and thinking in engineering; and
- A general capstone reflection, drawing together previous insights.

After reading these artifacts, we proceeded into the next step of analysis—descriptive coding (Saldaña, 2009). To carry out this stage of analysis, we engaged in a three-part process.

Part One of Coding

Individually, we began by carefully reading the discourse found in each artifact. After reading the artifacts, we placed all discourse in a Google Drive document and, following Tesch (1990), summarized the general topics in a word or short phrase (i.e., the general topics included in the reflection on disciplinary core knowledge; the general topics exploring writing and thinking in engineering; and the general capstone reflection). Next, we read through the discourse and the summaries of each of the discourses, further summarizing the general topics included in each of the discourses. Then, the words or phrases (i.e., codes) were generated after the second examination of the discourses, which we then combined, refined, and recorded in an initial electronic codebook.

Part Two of Coding

Before manual coding commenced, we tested intercoder agreement for the coding schemes developed for each artifact. To carry out this process, we met via Zoom to discuss and clarify procedures before manually coding three randomly selected discourses from each of the artifacts (nine samples total). To randomly select each of the discourses, and to remove bias from the selection, Ari and JT collaborated, first numbering all sentences in each of the artifacts. They then used a random integer generator, random.org, to identify the samples to manually code. Once the samples were identified, Ari and JT communicated to Marissa the sentences in each sample that would need to be manually coded. Each of us exchanged copies of our initial, electronic codebook before reviewing the coding schemes together, ensuring that we understood the codes. We then discussed and agreed upon our five-step manual coding process:

1. Locating the randomly selected sentences from each of the artifacts;
2. Printing the artifacts that included the sentences;
3. Physically cutting and pasting the sentences on a poster board, placing them on the left side of the board, and grouping together and separating out the samples from each artifact;
4. Writing down in pencil the initial codes developed for all three artifacts and placing them right across from each of the artifact groupings on the right side of the board; and
5. Using multiple Crayola crayons, coding each discursive sample, highlighting passages of the data, and connecting those passages with a line to a penciled code, reflecting the general idea included in the discourse from each artifact.

Once manual coding was completed, we moved into part three of the coding process.

Part Three of Coding

We met again via Zoom to review the coding schemes, noting the total agreements and disagreements that we had when coding each of the discourses. Using the total number of agreements and disagreements, we calculated intercoder agreement for each set of sample discourses. We used the following formula to calculate intercoder agreement:

$$\text{Intercoder Agreement} = \frac{\text{Number of Agreements}}{\text{Total Number of Ratings}} \text{ x } 1000$$

We underwent two rounds of norming to further refine problematic codes, eventually obtaining intercoder agreement above our 80% target. We then recorded all revised codes in one electronic codebook before manually coding the remaining discourse in the three artifacts.

Initial codes focused on Ms. Webster's expressions of how she was learning core knowledge and CT. Descriptive codes (e.g., personalizing; relating) were organized around two distinct themes, explored below. Like the general theme of this article—that core knowledge and CT are related, rather than opposite of teaching and learning decisions—the below themes, the personal/general and the relational/specific, initially signal opposite meanings, yet they emerge as related outcomes.

Findings

Ms. Webster's experiences assembling an ePortfolio offer a useful case study in how portfolios present pedagogical opportunities to cultivate critical thinking and content knowledge. Across Ms. Webster's experiences, her reflections revealed a shift from vague or descriptive accounts of learning to increasingly sophisticated and metacognitive insights. The ePortfolio became a space where she not only documented assignments, but also reinterpreted them, gradually constructing a more integrated view of herself as an Engineer. The below narrative is articulated chronologically, but that does not mean the themes should be read as developmentally linear or causally related. We simply report them in chronological order.

The Personal/General

At the beginning of the course, Ms. Webster's reflections were tentative and general. In her first portfolio entry, she admitted, "Before coming to Quinnipiac University, I did not take any engineering courses, in fact I only took physics." This acknowledgement of her limited background framed her early attempts at connecting with engineering content. She described terms and concepts vaguely and confessed that "Some of it [the content] doesn't feel natural." Ms. Webster expressed not just a lack of confidence in what she could recall, define, or even apply, but she also expressed an uncomfortable relationship (e.g., "doesn't feel natural") with the content. Noticing Ms. Webster's position on the CORE-CT Grid, as well as her own reflections, the instructor reinforced the notion that engineering does not always have a correct answer and that uncertainty can lead to new perspectives.

While describing later projects, Ms. Webster noted that "Our app project, bridge project, and rocket project showed me new ways to think and act as an engineer," and reflected that "I found my way of critical thinking and creativity to design the app, bridge, and rocket." These statements demonstrated her enthusiasm and willingness to grow, even if they remained focused on personal impressions. The CORE-CT Grid reflected Ms. Webster's "accurate" reflections but also the limited depth of her general conclusions. The instructor encouraged Ms. Webster to connect her personal impressions with disciplinary content, encouraging co-regulatory learning with clear next steps and continued reflective practice.

By the midpoint of the course, Ms. Webster's ePortfolio showed a marked progression toward disciplinary sophistication. Her writing demonstrated awareness, not only of what she did, but of why it mattered in the field of engineering. For instance, she observed, "Writing allows the engineer to communicate their design ideas, create instructions for the user, explain test results and provide information." Here, she situated writing as a professional competency, rather than merely a classroom requirement. She also recognized the collaborative dimensions of engineering, stating, "Learning about each discipline showed me what it took to be successful with projects, writing, and teamwork." These reflections moved beyond self-discovery to articulate the functions of communication and teamwork in engineering practice. They represented a "sophisticated" grasp of core knowledge, using disciplinary terms, and linking them to authentic applications.

The Relational/Specific

Ms. Webster's thinking also became more relational and contextual at this stage. In fact, when reflecting on teamwork, Ms. Webster noted, "Working in teams helped me meet new people and expand my knowledge by listening to what my peers suggested throughout our projects." This insight highlighted her ability to integrate peer learning into her development—a shift from merely describing her experience to explaining how collaboration enhanced her understanding. Though still reflective, rather than metacognitive, her midpoint entries revealed an expanding capacity to see herself as a learner and a participant in disciplinary practices.

By the capstone reflection, Ms. Webster's ePortfolio displayed a clear metacognitive stance. She characterized writing as central to engineering identity, reflecting, "The writing for engineers is art in words. . . . Each factor of the writing produces a piece that relates to their projects." This metaphor showed a nuanced understanding of communication as technical and creative. She further explained, "Now that I understand how to go about writing in engineering, I appreciate how important it is." These comments indicated not just disciplinary knowledge, but a reflective appreciation of its role across contexts. Most tellingly, she generalized her learning to broader domains: "While writing the

assignment, I was able to think about the many things that I learned . . . which I am able to apply to software engineering, my education, and life in general." Here, she demonstrated transfer, extending insights about communication and problem-solving beyond ENR 110 and into her academic trajectory and future career.

Taken together, Ms. Webster's case illustrates how the ePortfolio facilitated growth, from accurate but limited reflections to sophisticated and metacognitive insights. Early entries emphasized discovery and personal growth; midpoint reflections, showed developing fluency in disciplinary discourse. Capstone reflections revealed an ability to generalize, predict, and transfer learning through related contexts. By assembling and reflecting on her ePortfolio, Ms. Webster transformed isolated assignments into a coherent narrative of professional identity formation, evidencing the power of purposeful ePortfolio design to foster integrative learning in engineering education.

Discussion

The structured use of the CORE-CT Grid helped scaffold Ms. Webster's ability to reflect meaningfully on course content and learning processes. By using consistent language and categories for assessment, the framework encouraged her to link learning across assignments and to articulate growth in conceptual and cognitive domains.

Recent research across higher education disciplines has shown that portfolios, electronic or otherwise, can powerfully support critical thinking and integrative learning (Jenson, 2011; Torres & McKinley, 2023; Yancey, 2017, 2023). Conceptually, a portfolio is a purposeful assemblage of student learning. In effect, assembling a portfolio is a rhetorical act: Students select, organize, and contextualize artifacts to present a persuasive narrative about their skills and understanding (Gallagher & Poklop, 2014). By planning for multiple audiences—peers, instructors, employers, or other students—learners practice key rhetorical moves, such as designing coherent structures, situating content in context, and developing a flexible use of voice to meet diverse audience expectations (Gallagher & Poklop, 2014). This rhetorical stance encourages students to think strategically about why they learn and for whom, not just what they learned.

In our study, we examine how ePortfolios function as rhetorical assemblages that foster CT about course content. CT is typically defined as an intentional, evidence-based reasoning process that is best observed using performance assessments, such as artifacts assembled in a portfolio (Braun et al., 2020, p. 2). ePortfolios foster CT skills by requiring students to reflect on their work over time and justify their learning. Our study extends results from Bowman et al. (2016), namely, that when students have a mental framework for thinking about their learning, they exhibit greater awareness of connections beyond the course and more frequently relate their learning to future personal or career goals (p. 19). Similarly, when instructors have a clear mental framework for assessment, often in the form of a rubric, they gain improved assessment literacy, helping them make more accurate and timely decisions about students' learning needs (Gotch, 2022). For students and instructors, these reflective practices cultivate metacognition and deeper learning (Flavell, 1979).

As Ms. Webster considered how she learned and why her engineering assignments mattered, she practiced co-regulation and critical analysis. Consistent with co-regulatory learning, she applied feedback she received from peers—in the form of different design ideas, comments, questions, and so forth—as well as from her teacher (Andrade & Brookhart, 2021). As her understanding of core knowledge grew, she evaluated and incorporated diverse perspectives and appraised solutions using engineering judgment.

Bowman et al. (2016) reported that ePortfolios led students to make notably more connections to career or personal goals and to view their learning as linked across disciplines (p. 21). As a result, working on an ePortfolio transformed learning into a continuous, contextualized process, rather than a set of disconnected tasks. Our research suggests that purposefully designing portfolios can advance content knowledge and CT. To implement portfolios effectively across disciplines, we offer the following recommendations.

Recommendations

The CORE-CT Grid created the structure for the portfolio. The value of the process was not so much the collection of materials that typically comprises portfolio assessment, but rather what the portfolio was designed to do, cognitively and materially. The CORE-CT Grid determined sample selection, as well as how students composed and assembled samples. It provided an illustration of metacognition.

To effectively operationalize this illustrated metacognition, educators can use the structural framework of the ePortfolio to support two primary thematic dimensions of integrative learning, in a way that aligns with Barber's (2023) tripartite model of integration: connection, application, and synthesis.

The personal/general theme captures the introductory phase of integrative learning, where students transition from tentative, highly subjective disclosures of identity to broader structural awareness of disciplinary expectations. According to Barber (2023), this initial stage relies on helping students establish connections and discover similarities between ideas and their lived

experiences, even as those ideas remain conceptually distinct from one another. Educators can structurally support this theme through targeted audience awareness, personal reflection, and scaffolded practice, connecting reflections with disciplinary knowledge.

A central consideration in effective portfolio design is clarifying purpose and audience. Students benefit from knowing not only why they are creating a portfolio but also who is expected to engage with it. Because ePortfolios often serve multiple audiences—faculty, peers, external reviewers, and the students themselves—faculty should emphasize audience awareness early in the process (Gallagher & Poklop, 2014). Helping students develop rhetorical strategies, such as structuring their portfolio coherently, contextualizing artifacts through reflective introductions, and adjusting tone for different readerships, enables them to understand the portfolio as a narrative of learning, rather than as a static collection of assignments. This structured focus helps students anchor new learning with personal connections, even as they make general conclusions that lack professional sophistication.

To help students bridge the gap between their initial personal anxieties and broad, sometimes vague, core knowledge, educators must provide explicit reflective prompts that allow them to practice disciplinary discourse. Reflection is most powerful when it is intentional and explicitly connected to other contexts (Yancey, 2017, 2023). Embedding regular prompts throughout the portfolio process encourages students to practice terms, concepts, and ideas in low-stakes, but authentic, settings. Bowman et al. (2016) and Jenson (2011) highlighted that guided reflection produces richer, more integrative thinking. These prompts should, therefore, be woven throughout the curriculum, rather than left to the final stages of portfolio assembly. Early prompts should challenge students to examine personal artifacts from their home or lived experiences and contrast them with disciplinary definitions, helping them contextualize their general impressions.

The most effective portfolios are scaffolded across time, rather than assembled in a single assignment. Sequencing portfolio tasks—beginning with basic artifact collection, moving through early reflections and peer feedback, and culminating in synthesis—ensures that students develop sophistication gradually. In the personal/general phase, early scaffolding gives students permission to document their raw impressions and limited content backgrounds, establishing a safe, developmental baseline from which their disciplinary fluency can expand.

As students progress, their learning shifts toward the relational/specific theme, marked by localized peer integration and advanced metacognitive insights regarding knowledge transfer. Structurally supporting this theme aligns with Barber's (2023) secondary and tertiary dimensions of integration: application (i.e., using knowledge from one context in another) and synthesis (i.e., creating new knowledge by unifying disparate domains). Educators can structurally drive this theme through contextualized rubrics, multi-setting artifact integration, and systemic institutional support.

To push students from general descriptions to highly specific, relational arguments, assessment must explicitly value higher order reasoning. Assessment practices should also be aligned with the dual goals of disciplinary learning and CT. As Kelly-Riley et al. (2016) noted, robust scoring frameworks incorporate rhetorical knowledge and CT as evaluative criteria. When students understand that reflective analysis, synthesis, and metacognition are valued alongside disciplinary content, they are more likely to approach the portfolio as an opportunity for higher order reasoning. Transparent rubrics emphasizing these traits can provide consistent expectations and reinforce the integrative purpose of portfolio work, holding students accountable for the specific, relational claims required in capstone reflections.

Structuring spaces for boundary-crossing artifact collection directly mirrors Barber's (2023) emphasis on breaking down the borders between academic affairs and lived experiences. Portfolios are most meaningful when students recognize their relevance beyond the classroom. Encouraging them to include artifacts from internships, co-curricular activities, or civic engagement opportunities highlights the applicability of academic skills to diverse real-world contexts. Yancey (2023) found that students often discovered the value of their learning by considering how it resonated across personal, professional, and civic dimensions. Such reflection allows students to frame their education as a holistic process with enduring impact.

The progression into deep metacognition requires a dedicated space for capstone synthesis. Morreale et al. (2017) demonstrated that capstone ePortfolios in general education contexts foster significant gains in CT and curriculum integration when they build on earlier stages of reflection. Progression is, thus, key: Students should encounter the portfolio as an evolving practice, not an isolated product. By the capstone stage, educators should shift prompts from asking students what they learned to asking how specific competencies (such as communication or peer collaboration) transfer to future professional trajectories.

To ensure both themes emerge systematically, institutions must move away from treating ePortfolios as isolated, classroom-specific tasks and, instead, establish a sustained infrastructure that mirrors Barber's (2023) holistic vision of integrated educational spaces. The successful implementation of portfolios also requires adequate support. Faculty must receive guidance on the technological platforms and pedagogical strategies that

make portfolios effective. As Yang and Wong (2024) emphasized, student-centered pedagogy, clear purposes, and examples of strong portfolios are essential for effective implementation. Without this support, faculty and students may perceive portfolios as burdensome, rather than transformative. Structured workshops, resource libraries, and peer mentoring can address this gap and build confidence.

Finally, portfolio use should be embedded in a broader culture of reflection within an institution. When reflective practices are valued across programs and reinforced at multiple points in a student's academic journey, portfolios become more than isolated assignments. Morreale et al. (2017) argued that in capstone contexts, portfolios help counteract the fragmentation of general education by underscoring connections among courses. Extending this approach institution-wide can foster coherence across disciplines and signal to students that integrative, reflective learning is central to their education.

Conclusion

When supported by clearly articulated frameworks, such as the CORE-CT Grid, ePortfolios can facilitate the integration of disciplinary knowledge and CT in engineering education. This approach offers promising implications for assessment, instructional design, and student identity development in STEM fields.

Beyond its immediate application to a first-year engineering course, the CORE-CT Grid model highlights the broader potential of integrating structured frameworks with portfolio pedagogy. By giving students consistent criteria for assessing disciplinary content and CT, educators can foster metacognition and encourage transfer across courses and contexts. This alignment is particularly important in STEM fields, where faculty often feel pressure to "cover content" at the expense of higher-order reasoning (Henderson & Dancy, 2007, p. 020102). Portfolios can serve as dynamic platforms for connecting content knowledge and CT, transforming static assignments into a rhetorical assemblage that students consciously craft, linking disparate learning experiences into an integrated whole. Empirical studies have consistently demonstrated that when portfolios require reflection on multiple contexts, students show gains in metacognition, transfer, and higher-order thinking (Bowman et al., 2016; Buyarski & Landis, 2014). By thoughtfully scaffolding portfolios—with clear audiences, reflection prompts, and assessment aligned to integrative outcomes—educators across disciplines can leverage this pedagogy to deepen student learning. With such purposeful design, portfolios become more than assessment tools; they become catalysts for students to think critically, make connections, and own their learning journey.

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A pseudonym has been used so that our study participant remains anonymous. We have been given permission by our participant to quote from her written artifacts. As such, her original language has been retained, including errors.

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Embedding ePortfolio in Simulation-Based Interprofessional Education for Physical Therapist Assistant and Occupational Therapy Assistant Students: A Pilot Study

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In this pilot study, we examined ePortfolio as a high-impact practice (HIP) in a simulation-based interprofessional education (IPE) event between associate-degree level physical therapist assistant (PTA) and occupational therapy assistant (OTA) students at LaGuardia Community College (LAGCC). Through ePortfolio, students considered their roles as members of the larger interprofessional team and their development of professional identity. Key features of the ePortfolio design included digital collaborative workspaces, case study review and treatment planning, clinical documentation practice, and reflective practice. Data on student attitudinal and performance outcomes were collected using the Student Perceptions of Interprofessional Clinical Education-Revised (SPICE-R) and the individual Teamwork Observation and Feedback Tool (iTOFT) to measure observable behaviors in teamwork, leadership, shared decision-making, and patient safety. Post-simulation reflections using the PEARLS Healthcare debriefing tool were analyzed through thematic coding. Findings revealed strong performance in communication and teamwork. Although SPICE-R2 scores demonstrated an improvement in attitudes toward interprofessional collaboration, the change was not statistically significant. Significant differences were observed among teamwork domains assessed using the iTOFT ($p < .001$). Results highlight the benefits of integrating ePortfolio as a strategic shift toward integrated interprofessional learning at the associate degree level.

Preparing allied health students for contemporary clinical practice necessitates the inclusion of interprofessional education (IPE) and electronic medical record (EMR) documentation into the curriculum. In this pilot study, we describe a simulation-based IPE utilizing ePortfolio as a high-impact practice (HIP) to simulate EMR engagement and support collaborative treatment planning between physical therapist assistant (PTA) and occupational therapy assistant (OTA) students at LaGuardia Community College (LAGCC), located in New York City. The initiative was designed to promote clinical reasoning, communication, teamwork, and professional identity development through experiential learning in the classroom. The simulation design aligns with the INACSL Healthcare Simulation Standards of Best Practice (INACSL Standards Committee, 2021) and the Interprofessional Education Collaborative (IPEC) Core Competencies for Interprofessional Collaborative Practice (IPEC, 2023), which provided the foundation for developing student skills in the "role and responsibilities" and "teams and teamwork" competencies.

The PTA and OTA programs at LAGCC, accredited by the Commission on Accreditation in Physical Therapy Education (CAPTE) and the Accreditation Council for Occupational Therapy Education (ACOTE), respectively, lead to an associate in applied sciences (AAS) degree. Within two years, students graduate and enter the healthcare system with an entry-level skill set. Both programs of study regularly conduct periodic program reviews to align with evolving education accreditation standards and evidence-based practices. Within the rigorous clinical training in both programs, gaps were found in EMR proficiency and interprofessional collaboration, particularly in managing complex patients in acute settings. Improving skills in these areas will better prepare students for the growing demands for accurate, efficient, and legally sound clinical documentation in healthcare environments. Entry-level practitioners are expected to demonstrate proficiency in documenting patient progress and safety measures in real time across interprofessional teams.

While EMR systems are essential in healthcare, their use in classrooms is often limited due to cost and complexity. ePortfolio was customized as a pedagogical tool and digital record to promote team-based learning (Whitmore & Thacker, 2021). Key features of the ePortfolio design included collaborative workspaces, case study review and treatment planning, clinical documentation practice, and reflective practice. A documentation template using Google Forms was embedded in the EMR within ePortfolio for students to practice live charting and emergency response documentation aligned with clinical standards. Faculty supported the entire learning process, beginning with initial ePortfolio preparation and professional notation of medical information, continuing with guidance as students interpreted the case scenario for clinical practice, and extending into guided reflections on documentation and team building. Within their respective courses, OTA and PTA students were provided a guided pre-brief with faculty to orient the students to the ePortfolio and simulation. Students were assigned to review documents in the EMR and complete pre-simulation modules in the ePortfolio. Students asynchronously collaborated within the EMR subsection of the ePortfolio to review and annotate

notes on the medical record of a case study in advance of the interprofessional simulation event. On the day of the event, students were grouped into interprofessional teams and continued collaborating using the shared digital workspace in the ePortfolio. They documented findings, prioritized discipline-specific goals, and referred to the annotated notes in the medical record to simulate real-time decision-making for treatment planning. Post-simulation, students engaged in guided reflections on the experience using the PEARLS Healthcare Debriefing Tool (Bajaj et al. 2018).

By integrating collaborative documentation, team-based problem-solving, and reflective analysis, this simulation aimed to support both professional identity development and applied EMR literacy. To assess the effectiveness of the intervention, the Student Perceptions of Interprofessional Clinical Education-Revised (SPICE-R; Dominguez et al., 2015) and the individual Teamwork Observation and Feedback Tool (iTOFT; Thistlethwaite et al., 2016) were used to evaluate student attitudes and observed teamwork performance.

Literature Review

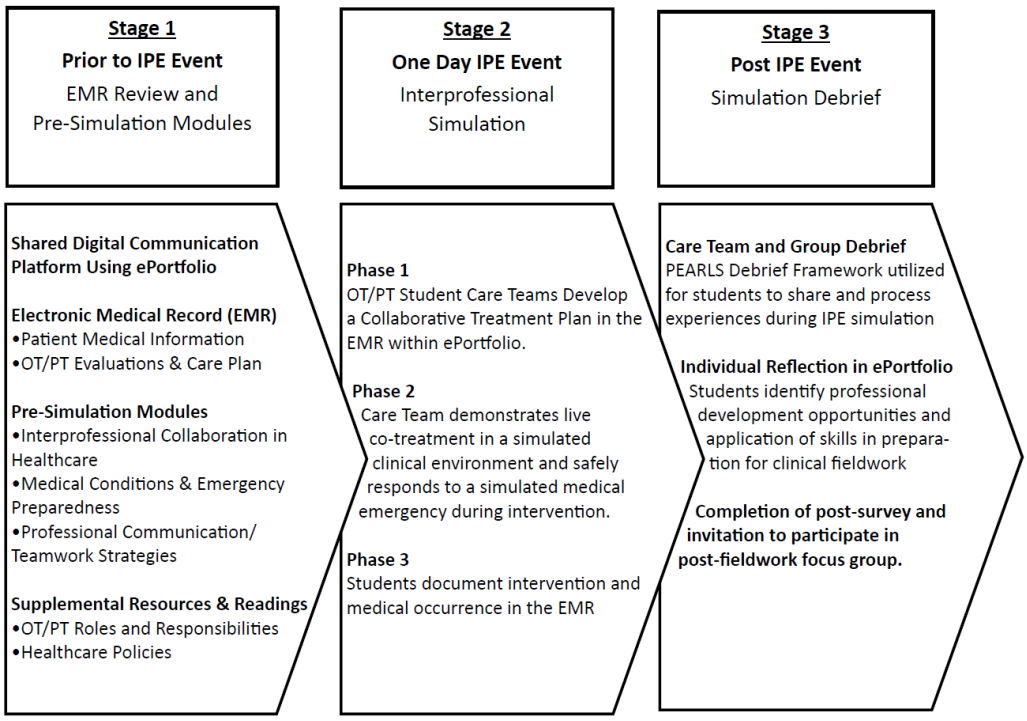
Interprofessional education (IPE) is a well-established framework for developing collaborative competencies among health care students; however, structured opportunities at the associate degree level remain limited, particularly for PTA and OTA programs. Gentry et al. (2022) demonstrated the value of simulation-based IPE in promoting collaboration among PTA and OTA students. Burrows et al. (2022) found that integrating academic electronic health records (AEHR) enhances understanding of interdisciplinary teams and student learning within PT and OT curricula. Copley et al. (2024) reported how multidisciplinary simulations led to improvements in communication and conflict resolution skills while Weiner et al. (2020) found statistically significant improvements in role clarity and readiness for collaborative practice following the use of simulations. McLaney et al. (2022) further described that structured interprofessional frameworks prepare students for hospital settings by developing team competencies in communication, conflict resolution, shared decision-making, reflection, role clarification, and values and ethics. These findings emphasize the value of integrated IPE models in acute care environments. Collectively, the literature suggests that intentionally designed simulation-based IPE experiences can strengthen teamwork competencies, clarify professional roles, and better prepare students for collaborative clinical practice.

Digital platforms such as ePortfolio offer a practical and adaptable approach to experiential learning, particularly in academic environments where there is limited access to simulated EMR training before clinical internships. ePortfolios support competency-based education through documentation, reflection, and interdisciplinary collaboration (Janssen et al., 2022; Whitmore & Thacker, 2021). When customized to mirror EMR systems, they provide a cost-effective alternative to proprietary EMR systems, allowing students to engage in real-time clinical reasoning, collaborative treatment planning, and interprofessional communication (Karsten et al., 2015; Robertson et al., 2022). Uslu and Stausberg (2021) further emphasized the value of EMR integration in hospital care, citing improvements in workflow efficiency and care coordination. Their findings support the adaptation of ePortfolio platforms that simulate EMR functionalities as effective preparatory tools for clinical documentation and interprofessional practice.

By simulating real-time EMR engagement, ePortfolio, as a HIP, supports technical skill acquisition and enables collaborative reflection and communication essential for interprofessional teamwork. Given the limited availability of structured IPE at the associate-degree level, integrating simulations with ePortfolio can promote digital documentation proficiency and collaborative competencies required for effective team-based care. In this pilot study, we directly address these gaps by implementing a simulation that is designed to increase EMR literacy and interprofessional readiness among OTA and PTA students, contributing to the advancement of workforce preparedness in medically complex clinical settings.

Constructivist learning theory posits that learners actively construct knowledge through authentic experiences, social interaction, and reflection rather than passively receiving information (Vygotsky, 1978). This perspective aligns closely with Kolb's (1984) experiential learning theory, which conceptualizes learning as a cyclical process involving concrete experience, reflective observation, abstract conceptualization, and active experimentation. In simulation-based education, tasks such as documenting in an EMR and engaging in team-based case discussions promote higher-order thinking and deepen clinical reasoning (Jolly et al., 2026). Purposeful integration of digital documentation tools further supports learners in synthesizing information, interpreting evolving patient data, and engaging in reflective practice, which are key components of experiential learning (Sawyer et al., 2016). Studies incorporating academic EMRs demonstrated that digital documentation within simulation environments enhances authenticity, supports scaffolding of clinical decision-making, and strengthens learners' digital fluency (Hong et al., 2022; Raghunathan et al., 2021). When paired with reflection, these experiences allow students to develop knowledge together, articulate their reasoning, and connect simulated practice to real-world clinical practice, reinforcing active learning through meaningful engagement.

Figure 1
Overview of the Stages in the Interprofessional Education (IPE) Simulation



Note. The figure depicts the three-stage simulation design consisting of pre-simulation preparation, a one-day interprofessional simulation event, and post-simulation debrief and assessment. ePortfolio was integrated throughout all stages to facilitate collaborative communication, documentation, and reflection.

Methodology

Twenty-five students (17 OTA, 8 PTA) participated in a three-stage IPE simulation in May 2024 that was incorporated as a co-curricular activity in one of the OTA or PTA clinical courses. Students were assigned to one of four interprofessional teams supported by two faculty facilitators, an occupational therapist and a physical therapist. The design followed a three-stage structure consisting of (a) EMR Review and Pre-Simulation Modules, (b) One-Day IPE Event, and (c) Post-IPE Event Simulation Debrief (Figure 1). A central ePortfolio webpage was configured to emulate the functions of an EMR for educational purposes, providing students with structured opportunities to engage in collaborative documentation, clinical reasoning, and digital communication as they progressed through each stage of the IPE simulation. Students from both OTA and PTA courses were added to the ePortfolio webpage where they were provided access to all simulation materials and could digitally communicate and interact with one another using the conversation tool function. Faculty portrayed the role of clinical supervisor to guide students throughout the IPE simulation to emulate supervision practices that students would encounter on fieldwork. This role included orienting students to the ePortfolio and monitoring student engagement and responses throughout the IPE simulation.

The IPE simulation used two assessment tools: Student Perceptions of Interprofessional Clinical Education-Revised (SPICE-R2; Dominguez et al., 2015) to evaluate attitudes toward interprofessional practice and the Individual Teamwork Observation and Feedback Tool (iTOFT; Thistlethwaite et al., 2016) to assess performance in teamwork, leadership, shared decision-making, and safety. The SPICE-R2, a validated self-report instrument, was selected for its sensitivity in detecting perceptual changes following short-term IPE interventions (Dominguez et al., 2015; Nicoteri, 2023). It has been widely applied across health professions education to evaluate students' attitudes toward interprofessional collaboration. The SPICE-R2 was administered to students at the beginning and conclusion of the IPE simulation. The iTOFT tool provides an observational tool that enables faculty to assess key behavioral competencies in teamwork, leadership, safety, and shared decision-

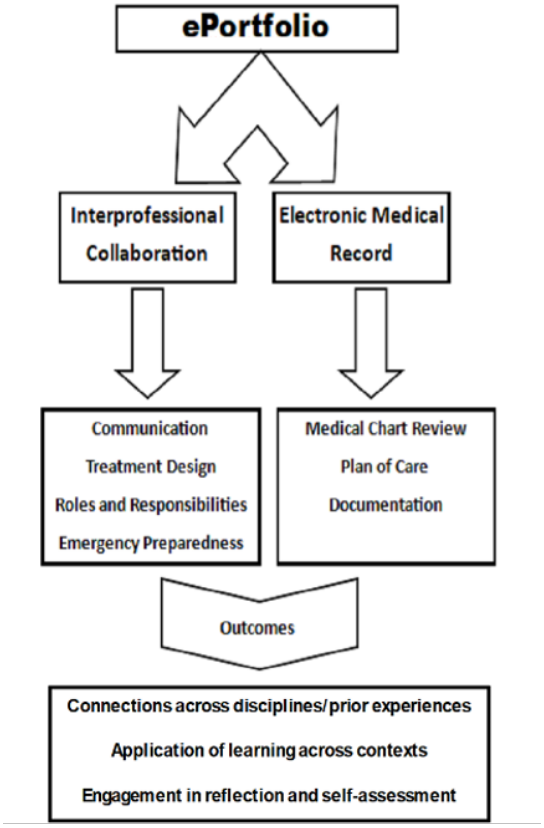
making during simulated clinical interactions (Thistlethwaite et al., 2016). Students also utilized this tool to provide peer feedback on their observations of collaboration between the two disciplines. These instruments support both formative assessment and curriculum refinement based on learner performance in real-time educational environments.

Through the customization of ePortfolio as a HIP, students engaged in integrative learning by connecting didactic content, prior experiences, and reflective practice as emerging clinicians. ePortfolio's versatility promotes a learner-centered experience (Chun-Burbank et al., 2023) as students interact with different perspectives, share knowledge, and synthesize information across disciplines for clinical practice. This strengthens a student's understanding and application of knowledge in two main areas: interprofessional collaboration and electronic medical records. The ePortfolio design scaffolded learning through collaborative documentation, treatment planning, clinical reasoning, and reflection. This multi-stage approach supported students' professional development and transfer of skills to novel clinical contexts (Figure 2).

ePortfolio Design and Platform

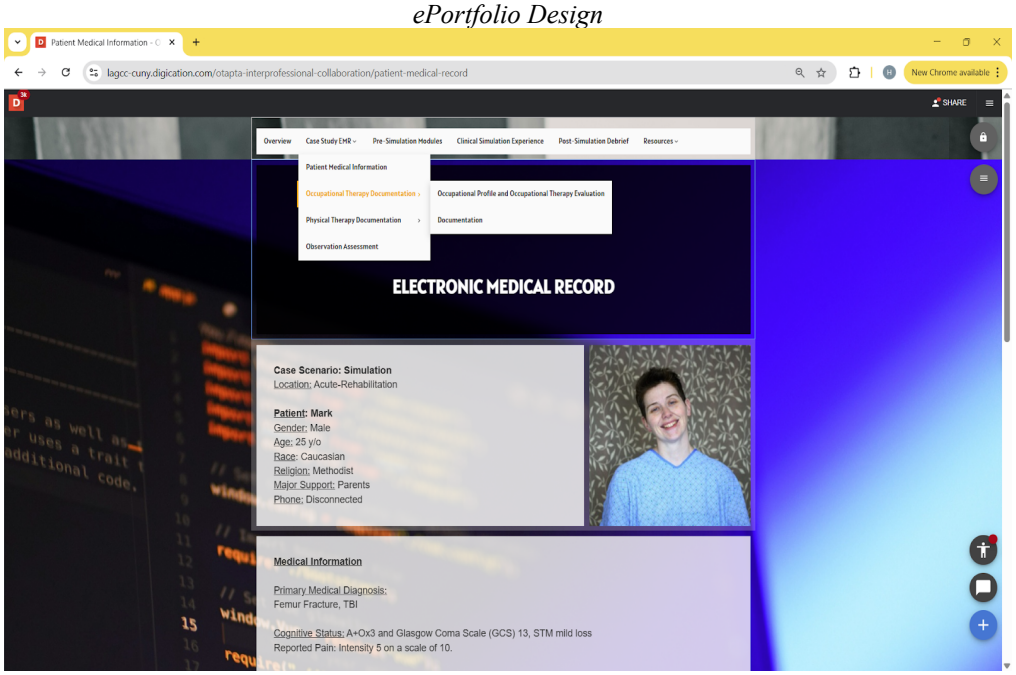
ePortfolio was selected as a web-based platform to facilitate IPE and to simulate clinical documentation practices. It is widely used in academic and professional settings to showcase student work, track progress, and support reflective learning (Digication, 2025). This platform was customized to design a model of an EMR system for students to collaborate and document clinical interventions in real time. The EMR system was customized within ePortfolio to enable students to review patient information, annotate treatment plans, participate in the collaborative development of patient care strategies, and practice clinical documentation (Figure 3). The platform provided a familiar digital interface that students previously utilized in prior coursework, allowing students to engage with digital tools to record, share, and assess clinical information. The ePortfolio also included Pre-Simulation Modules to prepare students with foundational skills in preparation for a one-day IPE event.

Figure 2
Integrative Learning Flowchart



Note. The flowchart illustrates faculty scaffolding of interprofessional learning through preparation, collaboration, simulation, documentation, reflection, and application to clinical practice. The ePortfolio platform supported student engagement in integrative learning throughout the simulation.

Figure 3
ePortfolio Design



Note. The ePortfolio platform was customized to simulate key components of an electronic medical record (EMR) and to guide students throughout each stage of the IPE simulation.

Key Features of ePortfolio for Promoting Interprofessional Collaboration

Collaborative Workspaces

Interprofessional teams of PTA and OTA students digitally collaborated using a shared workspace within the ePortfolio. PTA and OTA students contributed discipline-specific knowledge as members of an interprofessional team to foster team-based communication when developing the patient's care plan. This enabled students to share clinical information, co-create treatment plans, and clinical notes collaboratively, replicating the conditions of an authentic interprofessional healthcare setting.

A shared ePortfolio workspace promotes PTA and OTA student engagement in collaborative decision-making. By contributing their clinical knowledge and insights in the same digital space, students experience the benefits and challenges of working within a team-based learning experience (Whitmore & Thacker, 2021).

Case Study Review and Treatment Planning

Students were provided with a case scenario patient within the simulated EMR involving a 25-year-old patient admitted to an acute rehabilitation facility with a diagnosis of femur fracture and traumatic brain injury (TBI). This case study served as a basis for the simulation, where students discussed their discipline-specific roles and responsibilities in preparation for collaboratively developing an OT/PT co-treatment session.

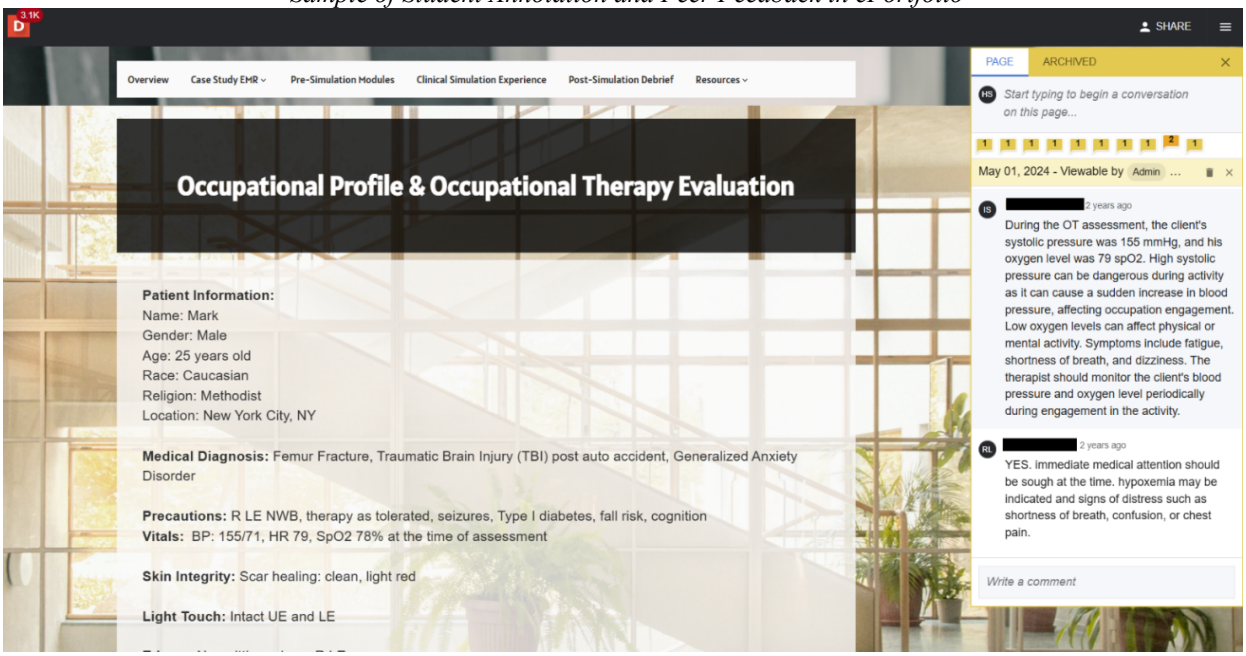
In the ePortfolio, students shared key clinical findings and prioritized treatment goals based on the patient's medical record and within their discipline-specific care plans. Each entry could be annotated with comments, clinical insights, and additional resources. The ability for students to view other student comments was designed to help simulate the dynamic nature of clinical care and the integrative process of treatment planning. Careful review of the medical record was also critical to anticipate potential emergency situations and engage in emergency response preparedness.

Clinical Documentation

ePortfolio permitted students to document the treatment session in real time, simulating the process of entering patient information into an EMR system. Through the ePortfolio, students gained hands-on experience in documenting patient assessments, treatment interventions, and progress reports.

Google Forms were integrated into the ePortfolio platform as pre-designed templates for treatment planning and progress notes based upon the simulation experience. Progress notes followed standard clinical guidelines using a SOAP (Subjective, Objective, Assessment, Plan) format to support real-time clinical

Figure 4
Sample of Student Annotation and Peer Feedback in ePortfolio



Note. The figure demonstrates peer annotation and collaborative review of patient information within the simulated EMR environment. Student identifying information has been removed to protect confidentiality. The annotations illustrate how students exchanged information and contributed discipline-specific perspectives during treatment planning.

documentation and ensure completion of essential documentation elements (Figure 5). Integrating Google Forms within ePortfolio enabled live documentation tools to be utilized within the platform for students to record patient progress, interventions provided, responses to treatment as they occurred, and modifications required during the session according to patient needs or emergencies just as they would in an actual clinical environment. Students also documented their treatment interventions as well as any modifications required during the session according to patient needs or emergencies.

Reflective Practice

Following the IPE simulation, students engaged in self-reflection following a group discussion using the PEARLS Healthcare Debriefing Tool (Bajaj et al. 2018). Students were encouraged to reflect on their treatment strategies, challenges faced, and how they collaborated with their peers during the IPE. Students utilized ePortfolio to self-evaluate their practice, recognize growth, and promote professional development in preparation for clinical practice in fieldwork. In addition, transformative learning occurred as students considered their roles as members of the larger interprofessional team and reflected on their developing professional identities.

The platform's integration of both reflective journaling and clinical documentation was utilized for students to critically assess their decision-making and to align their interventions with evidence-based practices. The post-simulation debriefs, where students reviewed their documented entries and discussed their experiences, further supported the learning process by prompting them to analyze their clinical reasoning and communication within an interprofessional team.

Through the ePortfolio, students were also able to track their own learning progress as well as observe how their peers contributed to the interdisciplinary care plan. This real-time collaborative process facilitated a deeper understanding of each profession's role in patient care and underscored the value of teamwork in achieving optimal patient outcomes.

Stages of the Interprofessional Education (IPE) Simulation

Stage 1 – EMR Review and Pre-Simulation Modules

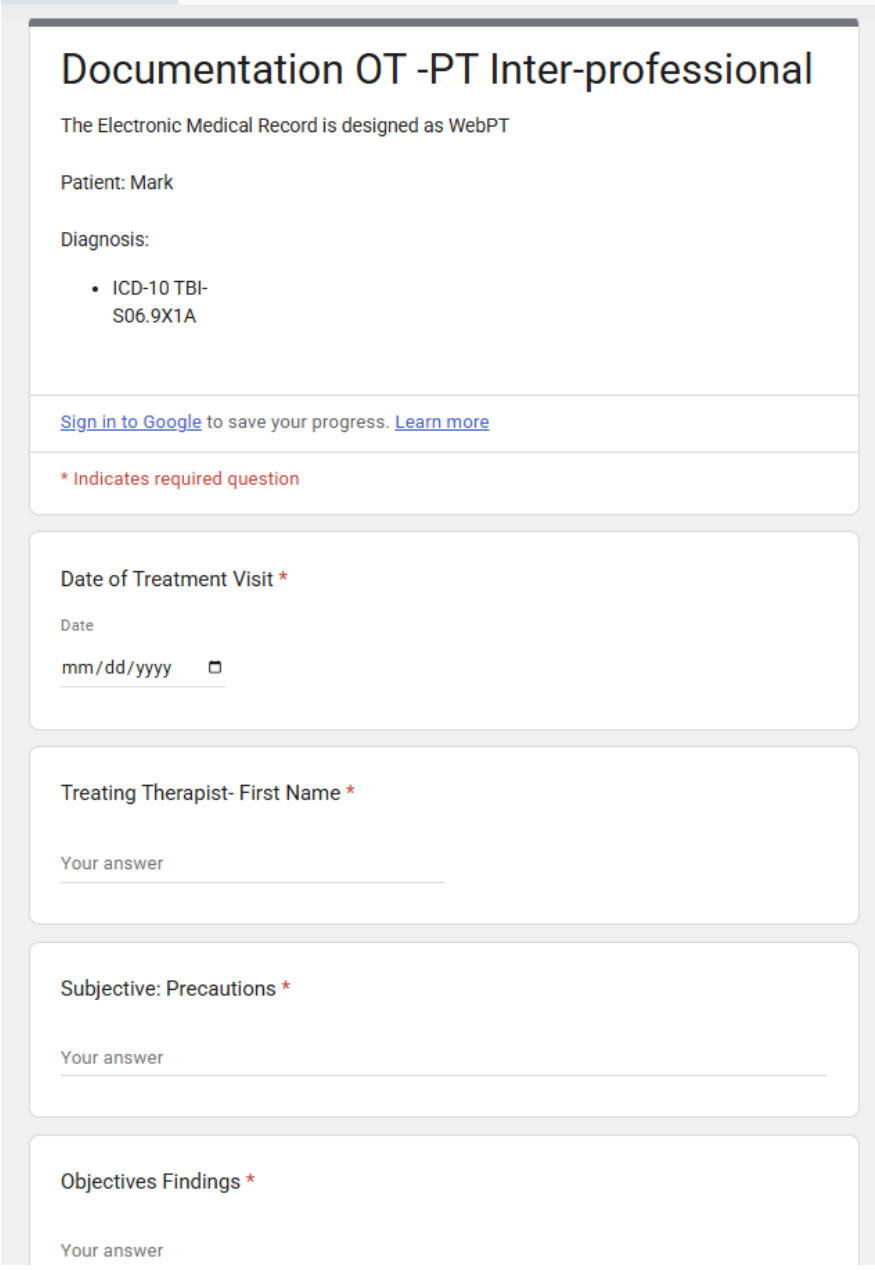
Prior to a live one-day IPE event, students completed a series of pre-simulation modules with the IPE ePortfolio to build foundational knowledge and prepare for the collaborative healthcare experience. These modules focused on the following topics:

- Interprofessional Collaboration in Healthcare
- Medical Conditions and Emergency Preparedness
- Professional Communication/Teamwork Strategies

Students also had access to supplemental resources and readings that addressed topics such as OT/PT Roles and Responsibilities and Healthcare Policies. Students were required to review the case study involving the patient's medical history, including OT and PT evaluations, and to document relevant information within the EMR section of the ePortfolio. Using the conversation tool in ePortfolio, students highlighted and annotated key clinical information in the EMR to share information and provide peer feedback (Figure 4). This facilitated shared understanding of the patient information in preparation for a one-day IPE event held on campus.

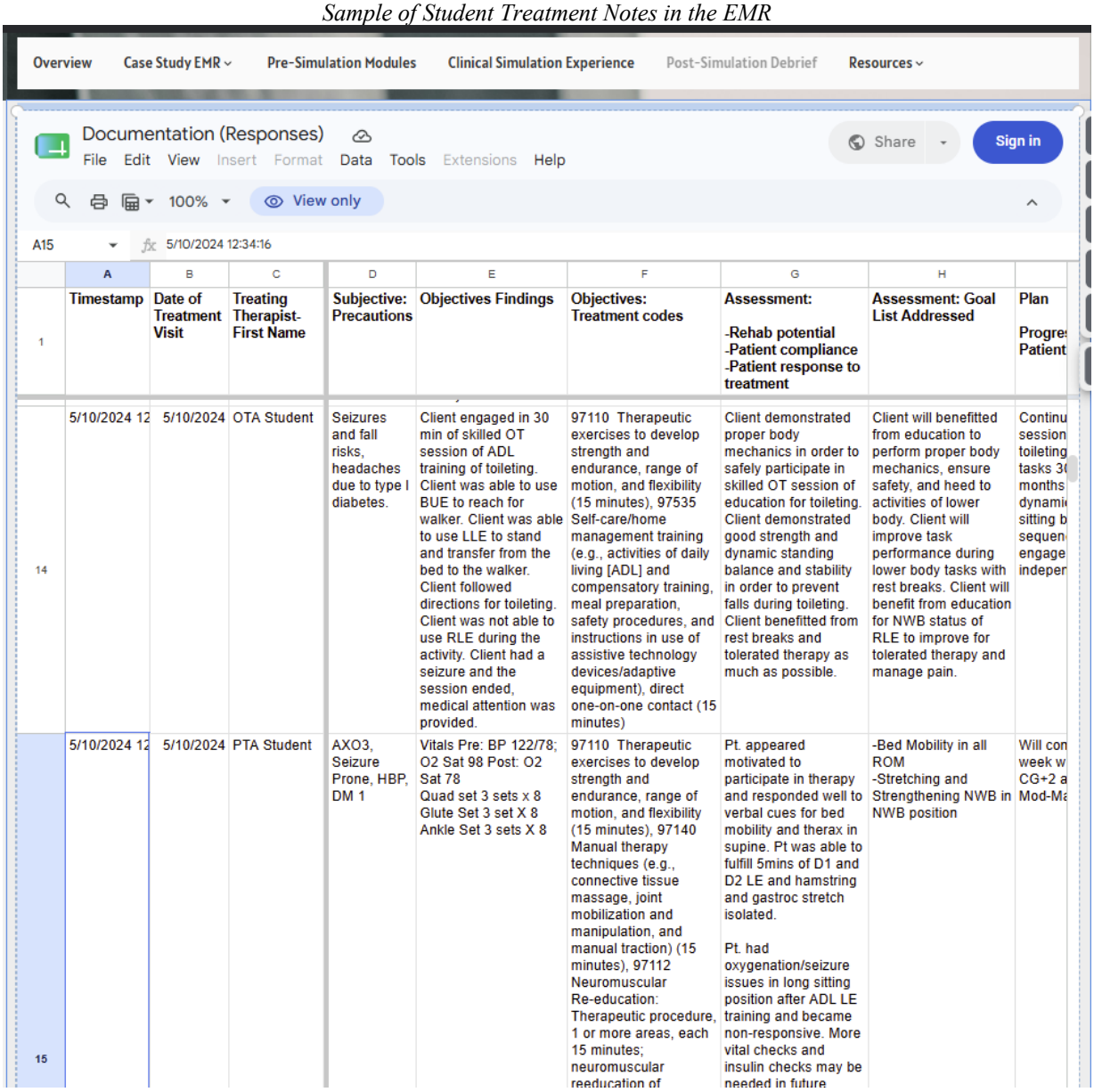
Figure 5

Documentation Form in Electronic Medical Record Within ePortfolio



Note. The figure illustrates the documentation form embedded within the simulated EMR. Students used the form to document the simulated treatment encounter in a format aligned with professional documentation practices.

Figure 6
Sample of Student Treatment Notes in the EMR



	A	B	C	D	E	F	G	H	
1	Timestamp	Date of Treatment Visit	Treating Therapist-First Name	Subjective: Precautions	Objectives Findings	Objectives: Treatment codes	Assessment: -Rehab potential -Patient compliance -Patient response to treatment	Assessment: Goal List Addressed	Plan Progre Patient
14	5/10/2024 12	5/10/2024	OTA Student	Seizures and fall risks, headaches due to type I diabetes.	Client engaged in 30 min of skilled OT session of ADL training of toileting. Client was able to use BUE to reach for walker. Client was able to use LLE to stand and transfer from the bed to the walker. Client followed directions for toileting. Client was not able to use RLE during the activity. Client had a seizure and the session ended, medical attention was provided.	97110 Therapeutic exercises to develop strength and endurance, range of motion, and flexibility (15 minutes), 97535 Self-care/home management training (e.g., activities of daily living [ADL] and compensatory training, meal preparation, safety procedures, and instructions in use of assistive technology devices/adaptive equipment), direct one-on-one contact (15 minutes)	Client demonstrated proper body mechanics in order to safely participate in skilled OT session of education for toileting. Client demonstrated good strength and dynamic standing balance and stability in order to prevent falls during toileting. Client benefitted from rest breaks and tolerated therapy as much as possible.	Client will benefitted from education to perform proper body mechanics, ensure safety, and heed to activities of lower body. Client will improve task performance during lower body tasks with rest breaks. Client will benefit from education for NWB status of RLE to improve for tolerated therapy and manage pain.	Continu session toileting tasks 3 months dynami sitting b sequen engage indeper
15	5/10/2024 12	5/10/2024	PTA Student	AXO3, Seizure Prone, HBP, DM 1	Vitals Pre: BP 122/78; O2 Sat 98 Post: O2 Sat 78 Quad set 3 sets x 8 Glute Set 3 set X 8 Ankle Set 3 sets X 8	97110 Therapeutic exercises to develop strength and endurance, range of motion, and flexibility (15 minutes), 97140 Manual therapy techniques (e.g., connective tissue massage, joint mobilization and manipulation, and manual traction) (15 minutes), 97112 Neuromuscular Re-education: Therapeutic procedure, 1 or more areas, each 15 minutes; neuromuscular reeducation of	Pt. appeared motivated to participate in therapy and responded well to verbal cues for bed mobility and therax in supine. Pt was able to fulfill 5mins of D1 and D2 LE and hamstring and gastroc stretch isolated. Pt. had oxygenation/seizure issues in long sitting position after ADL LE training and became non-responsive. More vital checks and insulin checks may be needed in future	-Bed Mobility in all ROM -Stretching and Strengthening NWB in NWB position	Will con week w CG+2 a Mod-Ma

Note. The figure provides an example of student-generated treatment notes completed during the simulation. The notes demonstrate clinical reasoning, documentation skills, and the integration of discipline-specific knowledge into the patient care process. Student identifying information has been removed.

Stage 2 – One-Day Interprofessional Education (IPE) Event

The one-day IPE event on campus consisted of three phases, each representing a crucial step in the interprofessional treatment planning and implementation process.

Phase 1 – Pre-Briefing and Treatment Planning. Students were divided into four interprofessional teams of PTA and OTA students. Each team was tasked with reviewing the case study and collaboratively developing a 30-minute treatment session, ensuring that the intervention was inclusive of both disciplines' specific roles and scope of practice. The teams were responsible for setting up the treatment environment within a simulated acute rehabilitation facility and selecting the appropriate equipment for the intervention. Treatment planning was documented in the EMR section of the ePortfolio.

Phase 2 – Treatment Implementation. During the treatment implementation phase, each interprofessional team engaged in co-treatment with a live model patient, following the collaborative treatment plan developed

earlier. Additionally, a simulated medical emergency was introduced during the intervention, based on the patient's medical history. Teams were required to demonstrate safety protocols and provide post-emergency care during this phase.

Phase 3 – Clinical Documentation. Students documented their treatment intervention in the EMR section of the ePortfolio, simulating the process of entering clinical documentation typically required in professional practice. This included detailing the interventions implemented, patient responses, and any additional notes related to the treatment process. Documentation of the intervention, including the emergency response, was recorded using a Google Form embedded into the EMR of the ePortfolio (Figure 6).

Stage 3 – Post-Simulation Debrief

Following the simulation, students participated in an individual reflection and group discussion to process their experiences. The PEARLS Healthcare Debriefing Tool (Bajaj et al. 2018) was used to guide the conversation, encouraging students to reflect on strategies implemented during the simulation, challenges faced, and solutions developed. The tool facilitated discussions on communication, teamwork, co-treatment, and safety/emergency response preparedness. Students were also encouraged to reflect on how the skills learned during the simulation could be applied to their upcoming clinical fieldwork experiences.

Figure 7

Sample of Peer Feedback on Collaborative IPE Using iTOFT-Advanced Form

iTOFT ADVANCED Version

Individual Teamwork Observation and Feedback Tool

Student ID	Student Observer	Observer ID	
Profession		Profession	
Year level		Student peer observer Yes/No	
Graduate entry Yes/No		Yes	

Institutional logo

Date 5/10/24

Activity observed: I saw the OTA's and PTA's stretch him out and help him work on bed mobility. The OTA's were then working on helping him use the dressing stick to help him put on his pants.

Team composition

Observable behaviours	Not applicable to this activity	Please tick one: Inappropriate	Appropriate	Responsive	Feedback for student
Shared decision making					Everyone was very involved and responsive to peoples ideas on how we should go about performing the interventions. Everyone is also a very good listener and didnt interupt anyone.
1. Plans patient/client care or group/community intervention with team members				✔	
2. Includes patient/client/family or group/community as partners in decision-making processes				✔	
3. Includes relevant health professionals in patient/client care management or group/community intervention as appropriate				✔	
Working in a team					People were able to work together in pulling ideas and bringing it together in their interventon plan. As well as when they were performing the interventions everyone was involved at least at one point.
4. Participates in interprofessional discussions about patient/client care or group/community intervention				✔	
5. Demonstrates respect for others in and outside the team				✔	
6. Invites the opinions of other team members				✔	
Leadership					My recommendation is to let the students know that they don't have to speak so formally to the patient on what you're going to do. The patient is here to get better and is looking to you to help him do so, letting him know with medical terminology can potentially agitate him. Just say what you're going to do and explain it to him and his caregiver in simpler terms.
7. When leading is sensitive to the needs of the team				✔	
8. Provides constructive feedback to team members about their performance				✔	
Patient Safety					Everyone handled the emergency very well and put the safety of the patient first.
9. Discusses patient safety issues with the team				✔	
10. Works with other team members to manage conflict				✔	
Overall global impression					Comment: Very good group that knew what they were doing and knew how to help him. As well as very rsponsive in the emergency and handled themselves very well.

Note. The figure presents an example of peer feedback using the Individual Teamwork Observation and Feedback Tool (iTOFT-Advanced). The instrument was used to evaluate observable teamwork behaviors related to communication, leadership, shared decision-making, and collaboration during the simulation experience. Student identifying information has been removed.

Table 1
Pre- and Post-IPE Simulation SPICE-R2 Mean Scores

	Students *n*	Pre-IPE *M(SD)*	Post-IPE *M(SD)*
OTA	17	4.34(0.331)	4.20(0.714)
PTA	8	4.39(0.349)	4.75(0.353)
Combined (unweighted)	25	4.38(0.329)	4.47(0.447)

Table 2
t-Test Analysis of SPICE-R2 Scores

Comparison	Test	*t*(*df*)	*p*
Pre vs. Post-IPE (Combined PTA and OTA)	Paired *t* test	0.95(9)	.413
PTA vs. OTA (Pre-IPE)	Independent *t* test	0.00(14)	.719
PTA vs. OTA (Post-IPE)	Independent *t* test	0.00(14)	.042

Note. Statistical significance was set at $p < .05$. The degrees of freedom (*df*) correspond to the number of students with complete SPICE-R2 domain scores included in each test. Ten students had complete matched domain data for the paired samples *t* test, and 16 students had complete data for the PTA versus OTA comparisons.

Select students completed the iTOFT to provide peer observations on the collaborative process, and all students completed a SPICE-R2 post-survey to assess changes in their interprofessional collaboration competencies, and their reflections were documented in the ePortfolio (Figure 7).

Data Collection and Analysis

Pre- and post-simulation scores from the Student Perceptions of Interprofessional Clinical Education-Revised (SPICE-R2; Dominguez et al., 2015) survey were collected. The SPICE-R2 is a validated, 10-item self-report instrument designed to measure health professions students' perceptions of interprofessional education and collaborative practice. It uses a 5-point Likert scale ranging from *strongly disagree* to *strongly agree* and assesses three key domains: interprofessional teamwork and team-based practice, roles and responsibilities for collaborative practice, and patient outcomes from collaborative practice. Responses were stratified by program, specifically PTA and OTA students, to examine group-specific patterns in interprofessional perceptions.

Descriptive statistics were used to examine changes in student perceptions of interprofessional education following a simulated learning experience. SPICE-R2 mean scores were analyzed separately for PTA and OTA students both before and after the IPE simulation, and combined scores were calculated using an unweighted average of the two group means (Table 1).

Pre-simulation data revealed comparable averages between groups, with the overall mean SPICE-R2 score across both professions being 4.38 (PTA: 4.39; OTA: 4.34). Post-simulation scores indicated a general increase in perceived value of interprofessional education, with a combined mean rising to 4.47. PTA students showed the largest increase, with their average improving to 4.75, while OTA students exhibited a modest decline to 4.20. The modest decline observed among OTA students should be interpreted with caution given the small sample size and exploratory nature of this pilot study. Future research with larger cohorts is needed to better understand potential discipline-specific differences in perceptions of interprofessional collaboration.

We used *t* tests to compare the mean scores of the SPICE-R2 scores for the combined PTA and OTA groups (Table 2). A paired *t* test comparing pre- and post-IPE SPICE-R2 scores for combined PTA and OTA students yielded a non-significant result, $t(9) = 0.95$, $p = .413$, indicating no statistically significant change in perceptions following the simulation. Similarly, a independent samples *t* test comparing PTA and OTA scores prior to the IPE showed no significant difference between group*p*s, $t(14) = 0.00$, $p = .719$. However, a statistically significant difference was found in the post-IPE scores between PTA and OTA students, $t(14) = 0.00$, $p = .042$, suggesting discipline-specific variations in perception following the simulation. These results point to a potential divergence in how the two groups experienced or responded to the IPE activity (Table 2). Degrees of freedom reflect the number of students with complete SPICE-R2 domain data included in each analysis. Although 25 students completed both the pre- and post- IPE surveys, only those with complete SPICE-R2 domain scores could be included in the statistical analysis. Ten students had complete matched domain data for the paired *t* test ($df = 9$), and 16 students had complete data for the PTA versus OTA comparisons ($df = 14$).

The Individual Teamwork Observation and Feedback Tool (iTOFT; Thistlethwaite et al., 2016) Advanced version was used to assess student

performance across four domains: shared decision-making, working on a team, leadership, and safety. This version includes 10 observable behaviors rated by trained observers, using a rubric that evaluates the presence and quality of each behavior during interprofessional teamwork activities.

A one-way ANOVA was conducted to evaluate whether statistically significant differences existed among the mean scores for four observed teamwork domains: shared decision-making, working on a team, leadership, and safety. The analysis yielded a significant effect, $F(3, 28) = 17.14$, $p < .001$, indicating that at least one domain mean differed significantly from the others. Descriptive statistics for each domain, including standard deviations, are presented in Table 3.

In the analysis of the iTOFT single-factor domains, the highest average score was observed in Working on a Team ($M = 6.00$, $SD = 0.00$), indicating unanimous agreement in strong team-based competence among participants. Shared Decision-Making also demonstrated consistently strong performance ($M = 5.50$, $SD = 0.75$). In contrast, Leadership had the lowest average ($M = 3.38$, $SD = 1.41$), reflecting greater variability and potential development gaps. Safety showed moderate consistency ($M = 3.50$; SD = 0.92), signaling a need for continued emphasis in training or assessment. Overall, the results reflect high performance in collaboration and communication domains, with variation suggesting areas for targeted instructional reinforcement (Table 4).To gain deeper insights into student reflections and interactions, qualitative data from the debriefing dialogue and written responses were systematically analyzed using Taguette, an open-source tool for qualitative coding and thematic analysis. The debriefing dialogue was conducted with the entire student cohort, facilitated by trained faculty using the PEARLS (Promoting Excellence And Reflective Learning in Simulation) method to guide discussion and promote critical reflection. Following the group dialogue, each small group submitted written responses, which were included in the analysis. Emergent themes from this process are summarized in Table 5.

Furthermore, sentiment analysis was conducted using ATLAS.ti, a qualitative data analysis software that enables in-depth examination of emotional tone and affective responses. This analysis facilitated the identification of underlying sentiments—positive, negative, or neutral—associated with the discussions, thereby illuminating the emotional and cognitive dimensions of student engagement. The sentiment distribution results are presented in Table 6, offering a comparative view across the identified themes.

Discussion

The use of ePortfolio as a simulated EMR tool within IPE significantly enhanced students' self-perceived competencies, particularly in communication and co-treatment planning. The findings suggest that the simulation, supported by the ePortfolio platform, not only improved perceived readiness for interprofessional collaboration but also identified curricular areas requiring further development in leadership and safety competencies.

ePortfolio's flexibility enabled students to annotate decisions, document care in real time, and collaborate asynchronously. Compared to costly proprietary EMRs, ePortfolio offered an accessible and feasible alternative that supports both learning and assessment. Features such as comment functions and embedded Google Forms supported both synchronous and asynchronous collaborative engagement. In this capacity, the platform served both as a documentation system and as an assessment tool, reinforcing competency-based education practices (Janssen et al., 2022). Faculty noted that students arrived at the simulation with annotated medical information, contributed meaningfully to discussions on clinical treatment, and demonstrated emerging documentation skills.

Table 3
One-Way ANOVA Results for iTOFT Domains

Source of variation	*SS*	*df*	*MS*	*F*	*p*	*F* crit
Between iTOFT domains	43.84	3	14.61	17.14	<.001	2.95

Note. ANOVA compared four teamwork domains: shared decision-making, working on a team, leadership, and safety.

Table 4
iTOFT Single Factor ANOVA

Domains	*n*	Sum	*M*	*SD*
Shared decision-making	8	44	5.50	0.75
Working on a team	8	48	6.00	0.00
Leadership	8	27	3.38	1.41
Safety	8	28	3.50	0.92

Table 5
Debriefing Themes

Theme	Frequency	Example
Client included	6	"Shared and seek information, integrated preferences, discussed opinions, advocated all with client"
EMR for decision-making	5	"Decreased my gap in clinical skills and preparedness to emergency situation and helps with starting clinicals"
Client not included	4	"Did not ask client what thinks about the idea or intervention"
Safety maintained	3	"More client information prior to session to create treatment and target goals"
Positive collaboration	14	"Members supported and sensitive. Polite and considerate with contributions to ideas of interventions"
Positive communication	11	"Communication formal during treatment with simple language with client and caregiver"

Table 6
Sentiment Analysis

Sentiment	Frequency	Example theme
Positive	17	Collaboration
Negative	11	Response to emergency
Neutral	10	Clinical decision-making

Results from the SPICE-R2 instrument indicated a positive shift in student attitudes toward interprofessional teamwork, with combined (unweighted) average scores increasing from 4.38 (pre-simulation) to 4.47 (post-simulation). Although this increase did not reach statistical significance in the paired-samples *t* test for combined OTA and PTA groups, the upward trend supports an enhanced appreciation for collaborative care. These findings are consistent with prior research by Gentry et al. (2022) and Karsten et al. (2015), who reported that even brief, structured IPE interventions can positively influence students' perceptions of teamwork and career preparedness.

Notably, a statistically significant difference in post-simulation SPICE-R2 scores was observed between the PTA and OTA cohorts ($p = .042$), suggesting that discipline-specific training or role expectations may influence perceptions of interprofessional collaboration. These findings underscore the importance of incorporating discipline-specific role clarification and collaboration exercises into IPE design.

iTOFT results further supported the development of interprofessional competencies, revealing that students performed most strongly in areas of teamwork and shared decision-making. However, lower average scores in leadership ($M = 3.38$) and safety ($M = 3.50$) indicate areas for targeted curricular enhancement. These differences were statistically significant according to the one-way ANOVA, $F(3, 28)$, $p < .001$. Such gaps are noteworthy given the critical role of leadership in clinical decision-making and emergency response. Incorporating structured crisis management scenarios, peer modeling, and guided leadership tasks in future simulations may help address these deficits. Future simulations should incorporate explicit leadership roles, critical decision-making scenarios, and emergency response protocols. These elements, supported by structured feedback from faculty and peers, can help cultivate student confidence in managing complex clinical situations collaboratively.

Post-simulation reflections and debriefings, guided by the PEARLS Healthcare Debriefing Tool (Bajaj et al. 2018), revealed several emergent themes. Students reported increased clarity regarding collaboration, emergency response, and clinical decision-making. The inclusion of a simulated medical emergency was cited as a particularly valuable component, enhancing the realism of the experience and testing students' communication and critical thinking under pressure. These reflective exercises, integrated into the ePortfolio platform, can facilitate identity formation and metacognitive awareness (Torres & McKinley, 2023).

Faculty review of the iTOFT scores indicated strong student performance in team building, role clarification, and clinical reasoning. Positive trends in SPICE-R2 scores were reflected in students' ability to actively extrapolate information from the case scenario, collaborate in problem solving, and synthesize information both verbally and within the EMR. These findings underscore the value of integrating ePortfolio-based simulations into the curriculum to promote interprofessional competencies, document clinical reasoning processes, and scaffold reflective practice.

Faculty were able to gain meaningful insights into students' clinical reasoning where emergency responses and collaborative treatments were safely handled, clarity and conciseness in documentation practices were evident, and overall preparedness for fieldwork was observed. The experience emphasized the significance of preparing students to meet the clinical requirements. By practicing real-time clinical notetaking, treatment justification, and interdisciplinary data sharing, students developed skills that are essential for documentation accuracy, accreditation requirements, reimbursement processes, and continuity of care. These competencies align with the professional standards increasingly demanded of entry-level healthcare providers.

Faculty observations suggested that ePortfolio provided greater visibility into student learning than simulation activities alone by allowing instructors to review treatment plans, clinical documentation, and reflective entries within a shared digital workspace. The platform supported team building by facilitating communication, shared decision-making, and the integration of discipline-specific perspectives throughout the treatment planning process. Faculty noted that the collaborative workspace made students' clinical reasoning more transparent and enabled instructors to observe how teams synthesized information, negotiated treatment priorities, and applied interprofessional competencies in real time.

Faculty also observed that ePortfolio provided evidence of professional competencies associated with workforce readiness, including communication, accountability, reflective practice, and leadership. While collaboration was consistently demonstrated across teams, variability was noted in students' willingness to assume leadership roles during treatment planning, emergency response activities, and team coordination tasks. The shared digital environment made these behaviors more visible by documenting student contributions and decision-making processes. These observations align with the lower leadership scores identified through the iTOFT assessment and suggest that future simulations should incorporate structured opportunities for students to practice leadership, role delegation, and team coordination within interprofessional settings.

Recommendations for Future Research

The simulation functioned as a dynamic platform for faculty to observe a student's ability to demonstrate live review of EMRs, organize treatment plans, and respond to emergent challenges. These tasks mirror essential responsibilities in clinical practice. Such observations provided valuable insight into students' preparedness for clinical placements and their capacity to function effectively under time constraints and within shared professional responsibilities.

To further support professional growth, the inclusion of structured video-based self-assessment is recommended. Reviewing recorded simulations involving team-based care, documentation, and critical incidents can enhance student self-awareness and clinical judgment. Embedding these video reflections within the ePortfolio environment, supplemented by standardized prompts and instructor feedback, creates a robust feedback loop that promotes deep learning and metacognitive development.

It is also recommended that future program evaluations incorporate post-fieldwork focus groups to assess the transferability of simulation-based learning to real-world clinical settings. These qualitative discussions can provide valuable insights into students' application of interprofessional collaboration and EMR documentation skills in practice, informing ongoing curriculum refinement to better align simulation activities with clinical demands.

In the future, this ePortfolio design could be adopted across other allied health programs to expand understanding of professional roles and strengthen shared documentation practices. Broadening its use would support greater healthcare efficiency by creating a unified digital space where learners from multiple disciplines can record, reflect, and track their clinical reasoning and contributions to patient care. The findings also have broader implications for interdisciplinary teaching and learning. As a collaborative digital workspace, ePortfolio can support integrative learning by enabling students from different disciplines to share knowledge, document project development, engage in reflective practice, and co-construct solutions to complex problems. The platform's flexibility allows educators to create authentic learning environments that promote communication, teamwork, and professional identity development across diverse academic and professional fields.

These recommendations provide opportunities for a strategic shift toward integrated interprofessional learning at the associate degree level. The ePortfolio platform provides a digital infrastructure to support implementation by enabling structured reflection, clinical documentation, and performance assessment across the student learning continuum. Embedding EMR and IPE competencies into core curricular activities prepares OTA and PTA students to enter the workforce as collaborative, reflective, and digitally literate healthcare professionals.

Conclusion

This pilot study demonstrates the potential of ePortfolio as a high-impact educational practice that supports simulation-based interprofessional education among PTA and OTA students. By integrating collaborative documentation, clinical reasoning, reflective practice, and simulated EMR functions within a shared digital environment, the project provided

students with opportunities to develop communication, teamwork, and documentation competencies that are essential for contemporary healthcare practice. Quantitative and qualitative findings suggest that the experience fostered interprofessional engagement, strengthened awareness of professional roles, and promoted reflection on clinical decision-making and emergency response preparedness.

Grounded in constructivist and experiential learning principles, the integration of ePortfolio extended learning beyond the simulation event itself by providing a space for students to document experiences, engage with peer perspectives, and critically reflect on professional growth. In this capacity, ePortfolio functioned as more than a repository of student work; it served as an active learning environment that supported the construction of knowledge through collaboration, reflection, and authentic clinical experiences. The combination of simulation and ePortfolio created opportunities for learners to connect disciplinary knowledge with interprofessional practice while developing skills that can transfer to clinical education and future employment settings.

Beyond its application within healthcare simulation, this study highlights the potential of ePortfolio to serve as an interdisciplinary learning platform that supports integrative and high-impact educational practices. By creating opportunities for students to collaboratively document experiences, exchange perspectives, and reflect on their learning, ePortfolio can facilitate meaningful connections across disciplines while promoting innovation, professional development, and collaborative problem-solving. As institutions seek approaches that prepare students for increasingly complex and team-oriented workplaces, ePortfolio offers a flexible framework for fostering engagement, integration of knowledge, and cross-disciplinary collaboration.

This study contributes to the growing body of literature on ePortfolio-supported interprofessional education by demonstrating how digital learning environments can be leveraged to promote collaboration, reflection, and workforce readiness at the associate degree level. Future research should explore the long-term impact of ePortfolio-supported simulations on clinical performance, professional identity formation, and interdisciplinary learning, while examining how similar models can be scaled across academic programs and institutional contexts.

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