2021 ASEE ANNUAL CONFERENCE
Virtual Meeting | July 26–29, 2021 | Pacific Daylight Time
Paper ID #35036

A Combined E-Portfolio and Microcredentialing Tool for Engineering Identities and Career Pathways

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Abstract

This work in progress paper describes a study of student use of e-portfolio and micro-credentialing resources for identifying academic and professional pathways. Micro-credentials and e-portfolios are popular resources for students and engineering industry professionals to demonstrate and verify one's skills and experiences beyond the classroom. A study was conducted at NYU Tandon School of Engineering and found students lack support in identifying and developing their career pathways. This study indicates that a combined e-portfolio and micro-credentialing platform could benefit students by a) providing students with a tool to reflect on and showcase their experiences, b) matching students with upper-class and alumni mentors in career pathways they are interested in, and c) providing them with curated lists of on-campus and experiential opportunities and micro-credentials that would support their career pathways.

Introduction

Every student's experience through engineering school culminates in different results -- students' future pathways range from academia to industry to entrepreneurship and more. While navigating their time in school, it can be helpful for students to learn from their peers and discover potential experiences that support their pathways. Current tools such as e-portfolios, micro-credentialing, peer to peer communication, academic advising, and informal professional networking are limited in their accessibility and effectiveness when used in isolation. Combining these tools and opportunities on a unified platform can enhance a student's exploration of pathways through their undergraduate degree.

Engineering portfolios have risen in popularity to track students' projects and experiences. Micro-credentials, or digital badges, allow schools to assess and verify students' experiences outside of their credited coursework. Experiences that students attain through workshops, clubs, work opportunities, research positions, and other professional development opportunities can all be tracked, presented, and verified through engineering portfolios and digital badges. An e-portfolio or micro-credentialing platform can complement students' resumes or coursework by showcasing a more holistic view of a student's interests. Examples of e-portfolios and micro-credentials include a personal website that lists academic and extracurricular experiences or badges on a professional networking profile, respectively.

Engineering schools have a range of opportunities for engineering students that can support multiple career pathways including academia, startups, industry, or non-profits. Oftentimes students need support on identifying career pathways and the opportunities that can facilitate the development of skills necessary for these professional pathways. However, the large number of different opportunities and support systems can make it difficult for students to navigate their options. Students interested in exploring pathways can benefit from a unified platform that makes them aware of and suggests various experiences and opportunities.

This study aims to expand on current e-portfolio research by developing an interactive web-based tool for students to discover opportunities and connect with experienced mentors related to the pathways they are interested in. With a tool that centralizes access to opportunities, micro-credentials, and mentors, students can learn from others' experiences, view available opportunities, and develop their own pathways. For example, a student interested in academia may use the platform to see what experiences or micro-credentials previous students interested in academia have engaged in while earning their degree. While modern e-portfolio platforms focus on showcasing students' work, this study seeks to include network development and a searchable database of opportunities to explore. By integrating e-portfolios, micro-credentials, advising resources, and connections to peers and alumni the tool can encourage students to consider all available and non-traditional pathways.

Literature Review

Paulson et al. define a portfolio as "a purposeful collection of student work that exhibits the student's efforts, progress, and achievements in one or more areas", and the authors also add that "the collection must include…evidence of student self-reflection" [1]. Knott et al. describes a pilot e-portfolio (electronic portfolio) project developed at Virginia Tech. The authors note that 88 percent of students wanted to continue using the e-portfolio as way of keeping samples of their work, recording their progress, and reflecting on their work [2]. Similar student appeal to e-portfolios is seen in [3]. Heinricher et al. also conduct a pilot project of three different portfolio models at Worcester Polytechnic Institute and found "portfolios increased students' goal-directedness with respect to learning and career, and their self-reflection related to their learning and professional development" [3].

As noted in Paulson's definition, the self-reflection or 'annotation' is an essential piece of a student's e-portfolio because it provides students with an opportunity to reflect on their experiences and how it ties into their engineering identity and career pathway. Turns et al. describe several generalized attributes of an effective, professional e-portfolio [4]. The characteristics include connecting an artifact to the future, providing details to add credibility, and presenting information with the audience in mind. These characteristics can be beneficial in an e-portfolio/micro-badging platform that aims to aid students in their career pathway development, career recruiting, and network development.

While existing research exists on digital badging for courses where students can earn professional skills like teamwork and project management [5] [6], limited research exists on the possibility of digital badges or micro-credentials for student work done within the university but outside of the classroom. Given the large, private university's recent development of workshops and mini-courses through the makerspace, library, career services office, and other departments, a micro-credentialing program for these workshops and mini-courses can be beneficial to students looking to add these experiences to their e-portfolio.

Little research has been done on e-portfolio's usage outside of the classroom. Similarly, there is a lack of research on combining an e-portfolio tool with micro-credentials on a centralized system that aims to help students a) build a network of students/alumni with similar interests, b) find opportunities relevant to them, and c) reflect on and showcase their experiential pathways. This

paper aims to study whether such a unified platform would be desirable to students at this large, private university.

Method

A survey was developed to address four questions: a) to what extent are students aware of on-campus opportunities that can help them identify their career pathways; b) to what extent do students make use of and find value in those on-campus opportunities; c) to what extent would an e-portfolio and micro-credentialing platform be useful to students; and d) what features and format would be most useful for students on an e-portfolio/micro-credentialing platform. Questions used for this study were inspired by questions developed for a survey by Schuman [7]. The survey contained 24 Likert scale questions [8], four multiple-choice/multiple-select questions, and four open-ended questions.

Participants in the study were undergraduate students enrolled in the engineering school of a large, private university. The survey was sent to students through newsletters of the undergraduate engineering student council, career services, advisors, library services, and makerspace beginning in the Fall of 2020 through February of 2021.

Analysis

Results (n=29) regarding the student awareness of, usage of, and value in on-campus opportunities are found in Figures 1, 2, and 3.

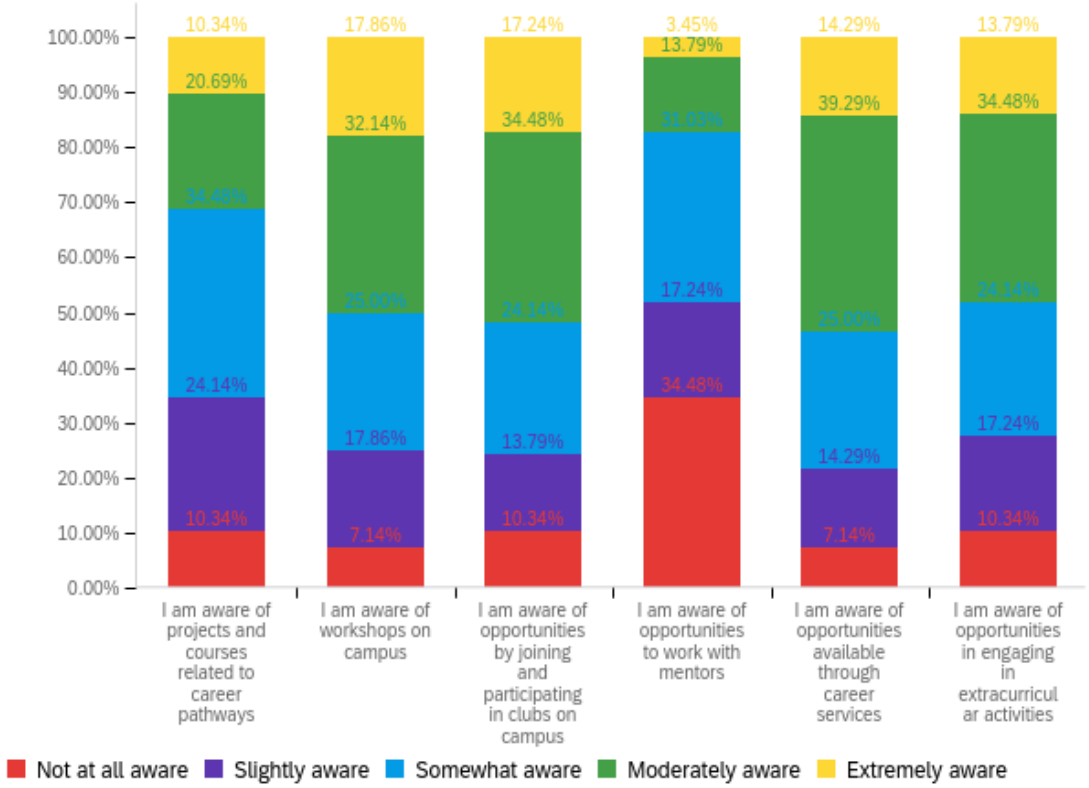

Figure 1 Student Awareness of On-Campus Opportunities Related to Career Pathways

While 79% of students were moderately or extremely aware of opportunities available through coursework, workshops, clubs, career services, or extracurricular opportunities, only 18% of respondents were moderately or extremely aware of mentoring opportunities (Figure 1). As a result, 69% of respondents noted interest in a mentorship feature and 76% were interested in an opportunities discovery feature (Figure 4).

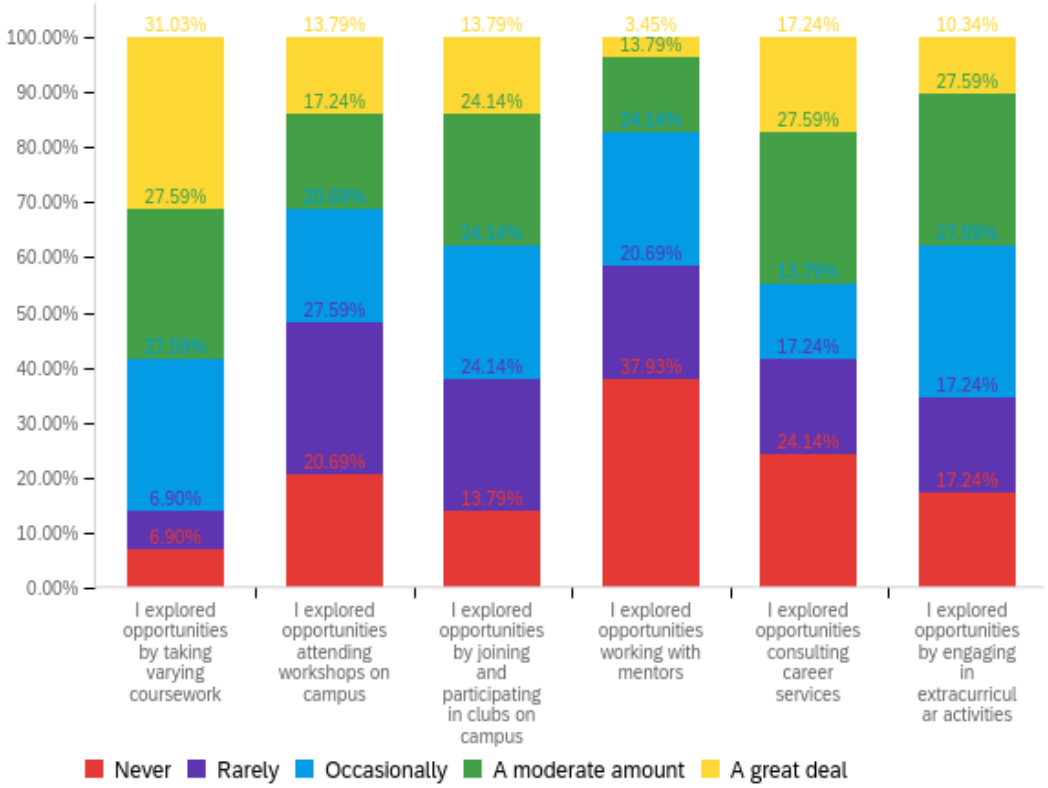

Figure 2 Student Exploration and Usage of On-Campus Opportunities Related to Career Pathways

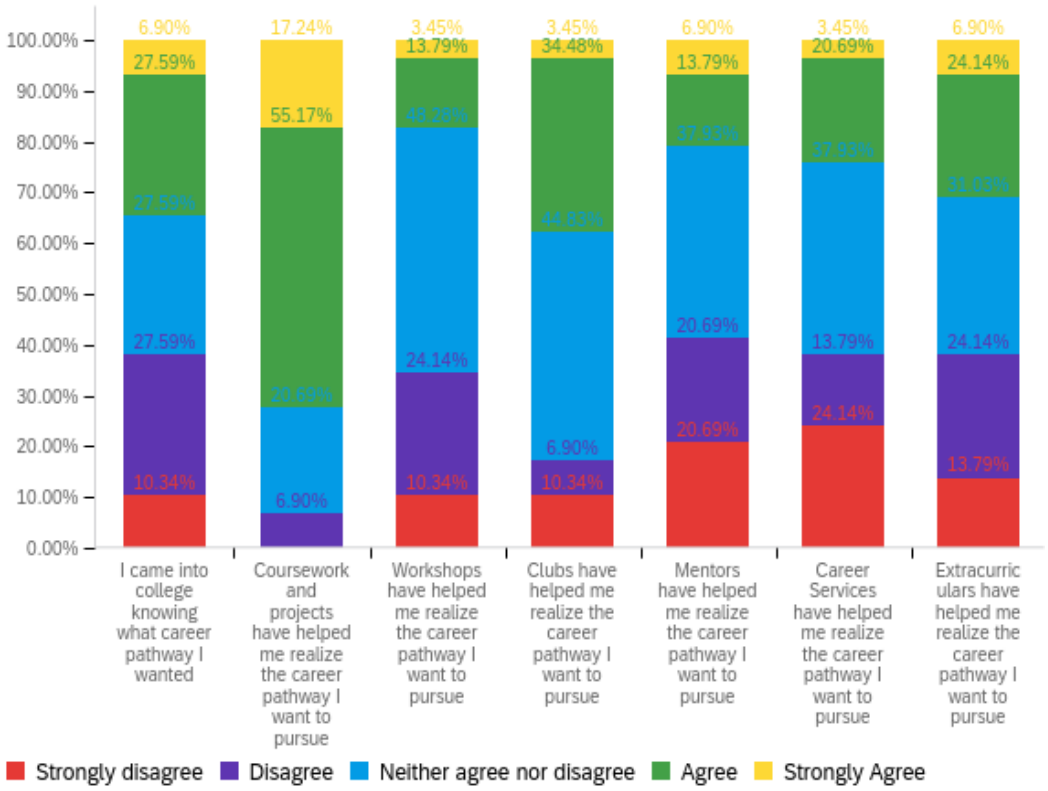

Figure 3 Student Discovery of Career Pathways

Students entered college with a wide range of expectations for their career pathway. Only 34% of respondents agreed or strongly agreed that they identified their career pathway before entering college. Coursework (72%) and clubs (38%) impacted students' pathways the most while mentors and career services were the most neutral. Those who made use of other opportunities, however, agreed or strongly agreed that those opportunities brought value to them.

Table 1 Value in On-Campus Opportunities Utilized by Students

On-Campus Opportunity	Moderately or Extremely Aware of On-Campus Opportunity	Moderately or Greatly Used On-Campus Opportunity	Agreed or Strongly Agreed the On-Campus Opportunity Supported their Career Pathway Development
Coursework	31% (9)	59% (17)	72% (21)
Workshops	50% (14)	31% (9)	17% (5)
Clubs	51% (15)	38% (11)	38% (11)
Mentors	17% (5)	17% (5)	21% (6)
Career Services	53% (15)	45% (13)	24% (7)
Extracurriculars	48% (14)	38% (11)	31% (9)

75% of students agree or strongly agree that there was some resource that helped them with the development of their career pathway. 71% of students agree or strongly agree that taking varying

coursework helped them identify their career pathway. While 7 of the 13 students who moderately or greatly used career services opportunities found value in those opportunities, only 53% of respondents noted moderate or extreme awareness of these opportunities. Similarly, all students who moderately or greatly used mentoring opportunities found value in their mentors. However, only 17% of respondents were moderately or greatly aware of opportunities to connect with mentors. It is clear that while opportunities exist on campus and bring value to students, there is a lack of knowledge of the varying opportunities and how they can support students.

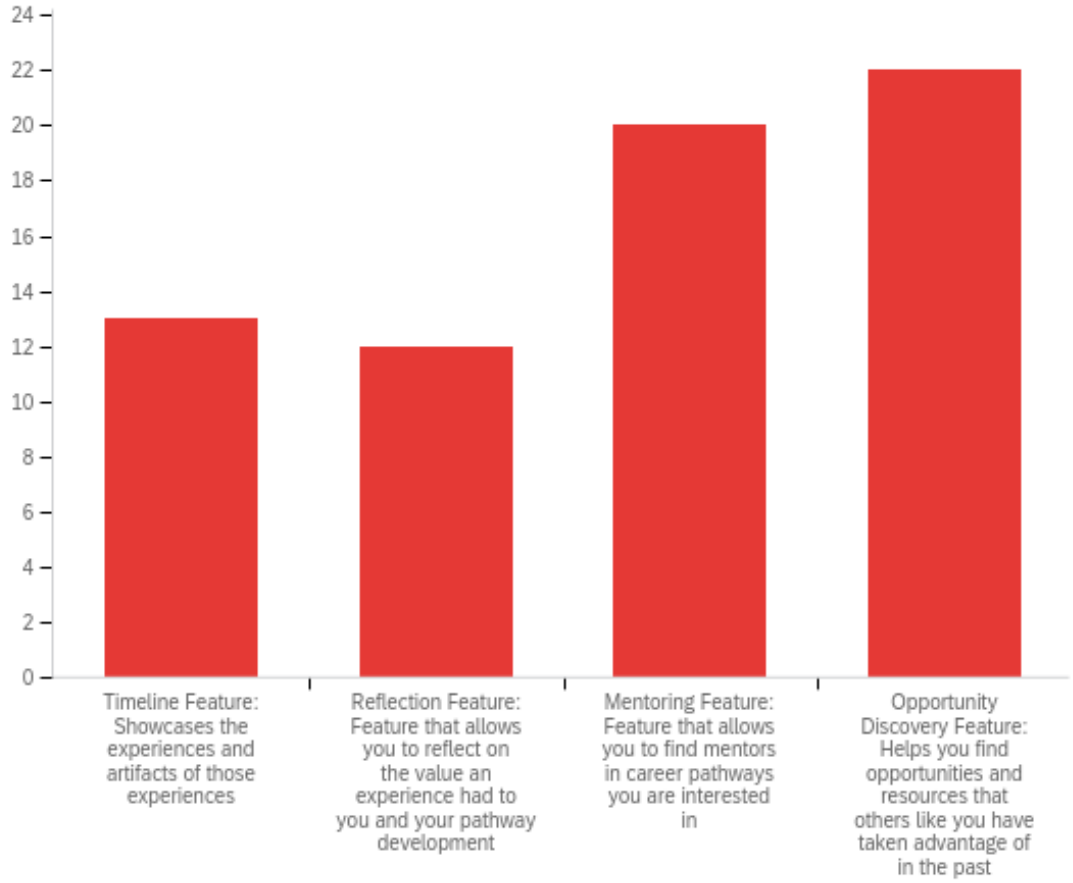

Figure 4 Student Interest in Various Features for this E-Portfolio Tool

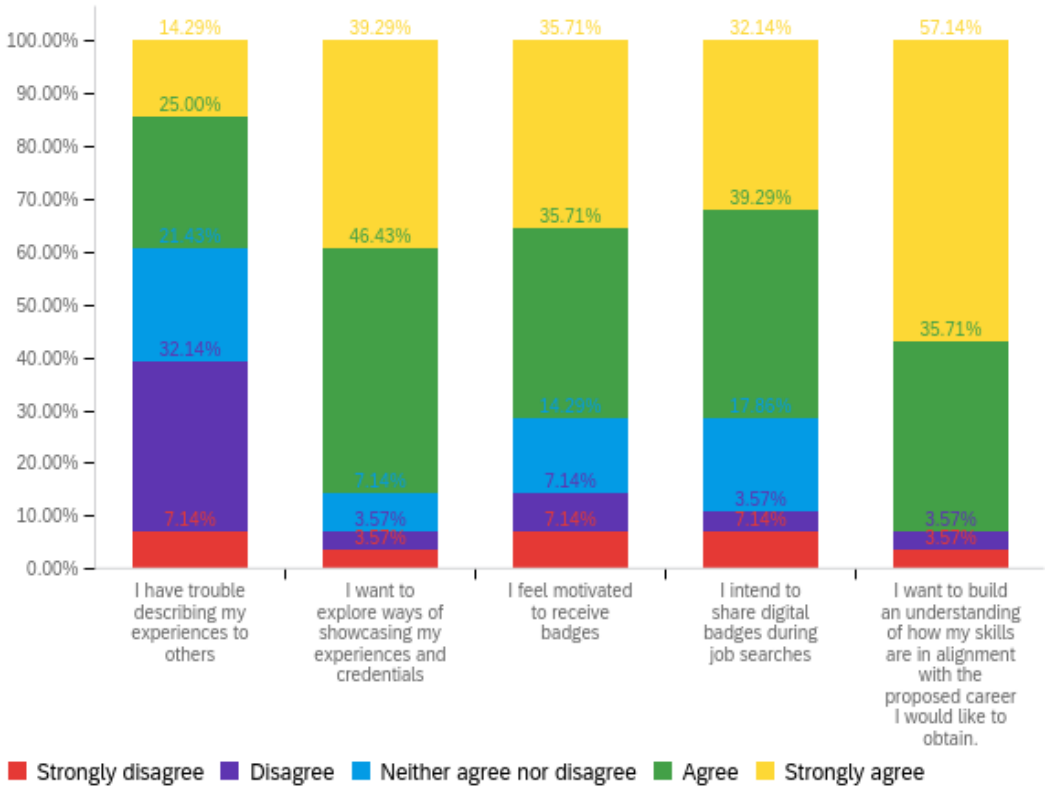

Figure 5 Ways an e-Portfolio/digital badging system can help students

Students were then asked to think about what features would be of interest to them, and 41% of students noted interest in a reflection feature and 45% of students indicated interest in a timeline feature. 71% of students responded with interest in digital badges, and 93% of students seem interested in the idea of reflecting and showcasing how their experiences align with their career interests.

Students are interested in learning different opportunities available to them and how to reflect on, showcase, and communicate their experiences. When asked, students responded that the most useful things to them would be “a mentorship program”, “being presented with as many opportunities as possible to find mentors” and “opportunities I should take advantage of specific to my major and current qualifications”. One student also noted a desire to connect “with those who have similar passions” as them.

Conclusion and Recommendations

A platform that unifies e-portfolios, digital badging, network development, experience showcasing, and the discovery of opportunities has significant potential to aid students in the development of their career pathway. Students are interested in utilizing these systems to support their journey in developing their career pathway.

From the data, it is clear that not all students have determined their engineering identity when they begin their undergraduate path. NYU Tandon School of Engineering has a plethora of resources, opportunities, and mentors that can support students interested in pathways including academia, industry work, entrepreneurship, or nonprofit work. Students who utilize these resources find value in them. However, the onus of exposing students to these opportunities, resources, and mentorship is on isolated offices, centers, advisors, programs, and on students to discover and find these resources. Given these resource silos, the most requested feature by students was an opportunities discovery feature and the ability to connect with mentors and peers with similar pathways.

This paper recommends a unified platform be developed at NYU Tandon School of Engineering based on the results of this research. Such a platform would serve several major goals. This platform would unite the different opportunities available so that students can easily explore opportunities and view opportunities recommended to them according to what students with similar interests have participated in. This opportunity recommendation feature would be powered by the data collected from students who use this platform to showcase their e-portfolios, pathways, and opportunities they have utilized at Tandon. As such, this platform would enable students to host their e-portfolios in creative and highly customizable formats. These portfolios would have the option of being private or public to students, faculty, and employers. Lastly, this platform would act as a network development tool that allows students to connect with other students and alumni with similar pathway interests as them.

The survey results show that students who make use of on-campus opportunities find value in those opportunities for their career development. Moreover, it shows that people are most interested in learning how they can reflect on their experiences, meet alumni/upperclassmen with similar career pathways, and discover new opportunities. The data also suggests that students prefer such a tool to be either a WordPress template or a tool built into the large, private university's learning management system.

As this large, private university begins developing this tool, this study recommends implementing features for students to easily find on-campus opportunities related to their pathways and to find mentors with similar career interests.

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