Penn State College of Engineering Micro-Credential Development, Evaluation, and Standardization

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Abstract:

Penn State is the flagship and land-grant university for the Commonwealth of Pennsylvania and therefore has an active outreach program serving Pennsylvania industry and citizens that has expanded in scope nationally and internationally over the years. Penn State is now evaluating how micro-credentials can be used to strengthen educational experiences and provide upskilling for its students and working professionals. The School of Engineering Design and Innovation (SEDI) in the College of Engineering (COE) is responsible for leading professional development instruction for engineers and others working in technical fields. As has become evident, particularly over the last decade, education and training pedagogies and delivery processes have changed dramatically. Currently, learners of all ages clamor for more flexibility in training. The traditional educational approach of full degrees in a discipline is being supplemented, and in some cases replaced, by shorter, focused training in specific skills sets. Micro-credentials are evidence of skills achieved and knowledge acquired. Stackable credentials resulting in micro-credentials are also on the rise. These offerings range from 100% on-line to a mix of face-to-face interactions over short periods of time (e.g., workshops that are 2 to 5 days). The delivery of most short courses, often advertised as fast tracking your career, preparing students to be work-force ready, short programs, or mini-skills are mainly asynchronous. SEDI has now leveraged its foundation of excellence and interdisciplinary faculty by expanding its Professional Development programs, and its micro-credential program plays a strategic role in Penn State success on many levels: *One Penn State 2025* Guiding Principle Four, the *College of Engineering Strategic Plan* Objectives 1.6 and 4.7, and the *SEDI Strategic Plan* Goal Three. This is a work-in-progress paper outlining SEDI's first Schoolwide micro-credential offering to the Higher Education marketplace from concept to development.

Introduction:

As has become evident, particularly over the last decade, education and training pedagogies and delivery processes have changed dramatically. Currently, learners of all ages clamor for more flexibility in training. The traditional educational approach of full degrees in a discipline is being supplemented, in some cases replaced, by shorter, focused training in specific skills sets. Proposed herein, these training protocols are rewarded with badges (after the completion of a short course) and a micro-credential after the completion of three short courses. Micro-credentials are evidence of skills achieved and knowledge acquired. The International Standard Classification of Education (ISCED) defines a micro-credential as a certification of assessed learning that is additional, alternate, complementary to or a component part of a formal qualification. Further to this definition is non-credit bearing micro-credentials that include assessment which may or may not be aligned to a formal qualification level. Stackable credentials resulting in micro-credentials are on the rise. These offerings range from 100% on-line to a mix of face-to-face interactions over short periods of time (e.g., workshops that are two to five days). The delivery of most short courses, often

advertised as fast tracking your career, preparing students to be work-force ready, short programs, or mini-skills are mainly asynchronous.

Definitions of Micro-credentials and Badges. As noted in the *MICROCREDENTIALS AND BADGES AT PENN STATE Status and Future Considerations (Fall 2020)* presented and approved by the Faculty Senate in November of 2021, standardized definitions for certain terms are as follows.

- *Alternative credentials:* micro-credentials, digital badges, and other industry-recognized certificates.
- *Digital open badge:* use of digital technologies to represent competencies and various learning achievements; electronic badges include standard metadata on the evidence of learning and link back to sponsoring institution and evaluation criteria. An open badge has specific technical standards, as dictated by IMS Global.
- *Certificate:* a credential issued by an institution in recognition of the completion of a curriculum that usually represents a smaller domain of knowledge than established degrees. Noncredit certificates need no external approval and must be identified as such. (At Penn State, use of the term "certificate" varies widely. World Campus offers undergraduate and postgraduate certificates for attaining 12–15 credit hours in an academic area; online short courses and in person workshops offer certificates of completion.)
- *Continuing Education Units (CEUs):* an accepted term in postsecondary institutions and training, awarded based on a standard of one unit per 10 hours of classroom contact.
- *Competency:* learnable, measurable and/or observable knowledge and skill sets gained.
- *Digital Credentials:* Refers specifically to micro-credentials or alternative credentials that are stored digitally, and that are digitally verifiable. Digital credentials are typically in the form of digital certificates or digital badges.
- *Stackable Credential or Career Pathway:* part of a sequence of credentials that can be accumulated over time to build up an individual's qualifications and help that individual move along a career pathway and further education.

A recommendation is that terminology within the School, College, and perhaps University is more consistent to avoid confusion on what constitutes a learner earning, for example, a badge or micro-credential. There is potential that learners outside the Penn State community will be confused when compared Penn State micro-credentials to other university offerings.

Program Development Goals:

The goals of the SEDI's first Engineering Design and Innovation (EDI) micro-credential offering to the Higher Education marketplace are three-fold: 1) to develop a micro-credential program (as defined below), 2) evaluate micro-credentials efforts across COE to build a framework that is consistent, and 3) pilot a micro-credential program with Penn State students and at least one industry partner.

Micro-Credential Program:

The goal is to develop a micro-credential program whereby learners would take three short courses (e.g., entrepreneurship, leadership, and intellectual property) culminating in a micro-credential. Unlike most short courses and micro-credentials offered throughout the nation, which are asynchronous, the foundation of these short courses will be hybrid (both synchronous and asynchronous). The synchronous formats provide learners the opportunity to engage with faculty and subject matter experts in a live collaborative format. These sessions will be recorded and uploaded to our learning management system so that those unable to join synchronously can watch when most convenient.

Each short course will be 15-hours in duration with a minimum of eight hours of synchronous learning. The additional seven hours will be learners reviewing supplemental reading and working on assignments (e.g., proforma development, business plans). Asynchronous videos could be included to supplement the short course. Herein, we propose a short course is 4-weeks in duration. Each course will have an accompanying assessment for each program. Each of these three program courses would form a micro-credential. If a learner takes all short courses across the EDI programs, they would earn a stacked EDI meta-credential. Depending on industry client and licensing requirements, CEUs could be awarded. Future short courses would evaluate how to incorporate industry subject matter experts. The experiential learning opportunities will be evaluated by faculty and subject matter experts. At the conclusion of the short course, learners receive a digital badge. In addition, learners complete a survey.

The intent of the synchronous portion of the short course is to create a highly interactive learning environment whereby students can engage with subject matter experts. In other words, there is an intentionality of ensuring that each short course motivate students to attend the synchronous sessions. Surveys will be provided to help understand how many attended the synchronous offerings versus choosing to take the short course asynchronously.

Evaluate micro-credentials efforts across COE:

To ensure a sense of cohesion and processes for adherence to standardization and quality measures, agile policies and procedures beginning from micro-credential proposal to micro-credential deployment and post-course evaluation would ideally be created and implemented by stakeholders. Standards, as well as understanding where there is flexibility within the micro-credential creation and maintenance framework, need to be agreed upon by relevant stakeholders. These standards will increase brand consistency and affinity as well as engender cost-effective program management. Ultimately, after sufficient successful offerings, short courses will be submitted for a rating through the Quality Matters program (https://www.qualitymatters.org). Achieving these ratings will be part of the brand image of the professional development curricula. As noted in the *MICROCREDENTIALS AND BADGES AT PENN STATE Status and Future Considerations (Fall 2020)* presented and approved by the Faculty Senate in November of 2021, standardized definitions for certain terms were defined. This task serves to catalog the micro-credential offerings throughout COE, interview developers of these programs to understand targeted audiences, and to draft a recommended framework that can build on existing efforts while working towards agreed to upon strategies. Proposal efforts will also provide a recommendation regarding a non-credit to academic credit pathway.

Pilot a micro-credential program with Penn State students and an Industry Partner

Our intended audiences include students (i.e., to help them be work-force ready) and industry. We will run these cohorts separately. We anticipate that the first short course will range from 15-25 students and then increase to about 25-35 students for the second and third short courses offereing in the sequence. We aim to cap enrollment at 35 students to help ensure a dynamic and interactive learning experience Underrepresented groups are less likely to pursue entrepreneurship, and therefore, this proposal aims to provide this population with the additional knowledge to assist them with their career aspirations. We will work closely with student organizations including the National Society of Black Engineers, Society of Hispanic Professional Engineers, and the Multicultural Engineering Program. The proposal team has been extremely successful in mentoring underrepresented students. For example, the Dr. Mazyck has previously served as the Director of Graduate Minority Programs for the University of Florida, more than half his PhD students were female and/or minority, and he has successfully built a company recognized as the Gator #10 out of #100 for 2020. This company has provided jobs for 13 of his former students. Furthermore, SEDI has recently adopted a Diversity, Equity, and Inclusion charter. The proposal team will coordinate with the College of Engineering's corporate and industry engagement team to identify one to two industry partners that would have interest in the proposal topics.

We envision we will be able to provide scholarships for minority students. These funds may help reduce the necessity to work a part-time job, and therefore, help these students gain these additional learning experiences.

The success of the program will be assessed through surveys post each short course. Lessons learned can then be applied before the next course to help address feedback.

Micro-credential course development milestones to date:

As of February 2023, faculty subject matter experts are being guided through the course development and deployment process by Dr. Meg Handley, Associate Professor of Engineering Leadership, and Casey Fenton of the College of Engineering's Office of Digital Learning (ODL). Dr. Handley's experience in creating previous micro-credentials for the Engineering Leadership program partnered with Casey Fenton's experience loading and deploying content through the Credly badging system has created an efficient, effective instructional design methodology for the first series of EDI micro-credentials. The first short course will be deployed April 2023 with subsequent courses deployed Summer 2023.

We anticipate using this pilot to evaluate the infrastructure requirements to help institutionalize the efforts, but based on previous experience some requirements will be continued ODL support, IT support (e.g., to address challenges integrating with the learning management system), and ideally dedicated synchronous studios. There are sufficient studios currently available, but as the number of cohorts increases additional interactive space would be desirable. There are a variety of pathways to supporting these initiatives. For example, as the program moves to paid learners in industry, revenue from these efforts would be earmarked to ensure the proper infrastructure is in place.

Lessons learned to date:

1. *Development Capacity:* As micro-credentials are added to SEDI's course catalog, instructional design development and deployment human resources and course software/CRM systems will be taxed. Resource capacity will need to be expanded, especially as we increase student and professional learner enrollments.
2. *Quality Monitoring:* Systemic monitoring of content, design, accessibility, and deployment will be vital to micro-credential and brand success. Quality Matters' micro-credential methodology and quality measures will be necessary to monitor micro-credential quality successfully.
3. *Marketing:* As referenced in the Holon IQ market research report (https://www.holoniq.com/markets/higher-education/global-online-degree-and-micro-credential-market-to-reach-117b-by-2025/), by 2025 *one billion* people worldwide will have attained a micro-credential post-secondary qualification. To date, Holon IQ projects the 2025 micro-credential and online education market "mid-COVID" to be $117 billion with a 17% compound annual growth rate. At present, Penn State's revenues in this area lag our competitors markedly. We will need innovative cross-channel marketing campaigns that is a new paradigm for our academic communications staff. These communication skills include websites, landing pages, email, digital marketing, event marketing, print media, videos, communications, mass SMS, and social media expertise.
4. *Pathway: non-credit to academic credit.* According to UPCEA, 347 academic institutions are evaluating a pathway program. 75% of these are four-year bachelor's programs. Key competitors such as Purdue University offer some pathway programs whereby the decision for a graduate faculty to accept a pathway program is at their discretion. A pathway program could be a key offering to provide industry learners on and off ramps and serve well to drive SEDI's Master's and D Eng programs.

Conclusion:

The Engineering Design and Innovation micro-credentials project is currently in development and will be piloted during the spring and summer of 2023. Best practices and lessons learned to date will be shared in our conference presentation. The EDI micro-credential program is one of SEDI's strategies to create multiple on- and off- ramps fostering opportunities for diversity among past, current, and future Penn State students regardless of life stage or geographic location. We anticipate that students who pursue these micro-credentials will likely (a) chose to enroll in at least one 3 credit course to gain additional knowledge, (b) perform better in interviews, and/or (c) seek opportunities for additional entrepreneurship or leadership opportunities.