Colorado Helps Advanced Manufacturing Program

Digital Badging in Colorado

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RUTGERS
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INTRODUCTION

Colorado Helps Advanced Manufacturing Program (CHAMP) is sponsored by a Trade Adjustment Assistance Community College and Career Training (TAACCCT) grant awarded by the U.S. Department of Labor. CHAMP involves a consortium of seven Colorado community colleges, a technical college, and a four-year university.[1] The Colorado Community College System (CCCS) provides technical assistance and management support for the CHAMP colleges.

The ultimate goal of the CHAMP project is to increase the rate of the attainment of certificates and degrees in manufacturing in order to best serve employers' needs in the following ways:

- By building on Colorado's existing and emerging manufacturing-sector partnerships and career pathway work to develop an employer-driven curriculum;
- By increasing the use of technology to accelerate training and reach a broader audience;
- By redesigning existing certificate and degree programs and establishing new online and hybrid courses;
- By developing stackable and latticed certificates; and
- By purchasing new state-of-the-art equipment and software.

In addition, the CHAMP grant facilitated the further development of CCCS' policies and procedures for awarding credits under Prior Learning Assessments (PLAs), which recognize students' prior experiences and skill sets gained in industry and the military. It is within this context that CCCS has led an initiative to develop and launch digital badges as an additional form of credentialing. These digital badges provide a "*verifiable, portable*" digital credential "with embedded metadata about skills and achievements" and are "*shareable across the web*" (Mozilla Foundation, n.d.).

This brief discusses the development and implementation of digital badges under the CHAMP grant. It has been prepared by Rutgers University's Education and Employment Research Center (EERC), the third-party evaluator for the CHAMP project.

Part I describes methodology and data sources. Part II provides a brief overview of the history of digital badges. Part III focuses on CCCS and its activities related to the development of digital badges in advanced machining. Part IV presents early feedback from industry and faculty on the badges and their use. Part V discusses plans for sustaining and scaling badges subsequent to the end of the CHAMP grant.

[1] The CHAMP consortium includes Front Range Community College (FRCC), Aims Community College (AIMS), the Community College of Denver (CCD), Emily Griffith Technical College (EGTC), Lamar Community College (LCC), Pikes Peak Community College (PPCC), Pueblo Community College (PCC), Red Rocks Community College/Warren Technical College (RRCC), and Metropolitan State University, Denver (MSU).

PART I: METHODOLOGY

EERC used qualitative methods to explore the development, implementation, and use of digital badges. EERC team members engaged in phone and in-person interviews with faculty and staff at consortium colleges as well as with senior staff at the CCCS office.

Most interviews were taped and transcribed; non-taped interviews involved extensive note taking. Transcriptions and notes were coded using NVivo qualitative data management software and were analyzed by EERC team members.

In addition, the EERC team reviewed relevant literature and conducted a content review of badging-related materials developed by CCCS and/or individual colleges. EERC also examined data posted to the Credly website. Credly is the digital badge vendor and portal CCCS is using to track the awarding of badges and to observe how they are used and discussed in social media.

PART II: FROM THE LITERATURE

Digital badges are mechanisms for assessment and credentialing that are housed online. The intent of digital badges is to serve as an assurance of the acquisition of skills or knowledge through either formal or informal learning. Badges provide a more granular or tailored view of a student's skills than typical academic credentials, as they can include measures of "*experience, competency, and quality*" (Casilli and Hickey, 2016). Ahn, Pellicone, and Butler (2014) argue that badges act as "*signifiers of what knowledge and skills are valued, [as] guideposts to help learners plan and chart a path, and as status mechanisms in the learning process*." Finkelstein, Knight, and Manning (2013) add that badges can serve as milestones for students, increasing motivation and retention. They also note that badges make the new skills students acquire more "visible."

Badges can also expand the concept of where learning can happen and how it can be validated, capturing skills developed from in the field in both formal and informal settings – e.g., practicums, apprenticeships, and employment – using industry or professional standards for skill assessment.

Some argue that employers, especially those in technology, education, and healthcare (Beals, et. al, 2015; Erickson, 2015), have found badges helpful in matching applicants' knowledge and skills to job requirements (Bradley, 2016). Badges can also be helpful to industry in recognizing new knowledge and skills incumbent workers acquire through additional on- and off-the-job training opportunities. Employers, however, have not unconditionally embraced the movement toward badges. Bradley (2016) reported that hiring professionals still primarily rely on college degrees, certificates, or licenses to judge candidates. In fact, in that study, representatives from only about half of the companies reported that they would accept a badge as a supplement to previous work history or a traditional degree.

Nonetheless, badging – specifically online digital badging – is gaining attention with industry, and academic institutions are investing in its further development and use.

PART III: THE COLORADO COMMUNITY COLLEGE SYSTEM AND DIGITAL BADGING

In Colorado, CCCS oversees both community colleges and vocational education. This dual role means that CCCS is invested in developing programs and mechanisms to facilitate the preparation of students for both higher education as well as for the workforce.

As part of this investment, CCCS recently refined the policies and procedures surrounding Prior Learning Assessments (PLA), which recognize skills and knowledge acquired in industry, the military, or through other experiences by translating them into college credit. The PLA refinement process, partially funded by the TAA CHAMP grant, was launched in February 2015.

In May 2015, the Colorado Governor issued a directive to increase stackable certificates and micro-credentialing (Personal communication, B. Perea, February 24, 2017). This directive reflected the State's recognition of the growing number of jobs in Colorado's advanced manufacturing sector that went unfilled despite local colleges graduating students with certificates and degrees in a variety of manufacturing fields. In part, these unfilled jobs reflected employers' needs for specific skills and knowledge sets that were not being reflected in academic certificates and degrees, nor from employers' reviews of courses on applicants' transcripts (Perea, Chieppo, and Woodmansee, n.d.). In response, in the summer of 2015, the CCCS president directed the system to create digital badges in advanced manufacturing. This initiative arose out of the above-cited work done on both competency-based education and PLA refinement.

Funded by CHAMP, the digital badging initiative was launched in 2015 and continues to date. CCCS facilitated the project, with its chief instructional designer taking a lead role. The project involved educating both faculty and employers about the potential of digital badges as well as guiding the actual work of developing the badges. To this end, a series of collaborative and intersecting industry-sector summits, business advisory groups, task forces, and work groups were convened for actual and potential stakeholders. Working together, these groups identified the competencies most needed by industry, reviewed badging projects, and explored accessible platforms and standards.

A white paper on digital badging was then produced (Personal communication, B. Perea, February 24, 2017). This white paper situated the development of digital badging within CCCS' 10-year strategic plan (2015–2025) and included a framework or "*ecosystem for issuers, earners, [and] consumers/receivers"* (Perea, n.d., pp. 3–4).

The project adopted the 2012 Open Badges Standard developed by the MacArthur Foundation, Mozilla, and the Peer2Peer University. Under this standard, the issuing institution attaches

"*verification data and evidence of skill attainment to the badge image file, hard-coding the metadata*" (Perea, Chieppo, and Woodmansee, n.d.). This enables verification of skills and mastery and ensures future access and outside review.

In addition to using the Open Badge model, CCCS decided to establish a hierarchy for its badges. Initially, CCCS identified four tiers: *Excellence, Mastery, Expert,* and *Proficient.* However, after some discussion, industry requested that *Proficient* (equivalent to a grade of C) be dropped so that badge earners were "*either excellent, expert, or masters of specific skill sets."*

Badging Implementation Process

Given input from industry that included specific details about the competencies they needed, CCCS along with MSU began to create a series of badges in technical math, engineering graphics, and machining.

To develop the badges, work groups for the above three fields were convened. These work groups included faculty and instructors, department heads, members of CHAMP business advisory groups, and instructional designers. The Technical Math badge series was developed by using CCCS 's MAT 108–Technical Math Competencies course as well as input from employers who identified the math skills needed *"on the floor"* of their manufacturing shops. Existent NIMS certifications were used as a blueprint for the specification of Machining Level 1 skills.

In addition, the work groups engaged in "backward design." They took the skills industry had identified and then *"organized the identified skills into groups of competencies and then proceeded to determine levels of mastery – differentiating between proficiency and mastery"(*Personal communication, college staff, spring 2017*).* They then reviewed program and course curriculum to identify where such competencies were being taught – and mastered. This included attention to the types of evidence that could verify competency; the assessments program courses used to measure skill acquisition; and the means to ensure that evaluation methods and standards would be consistent across all CCCS schools. The work groups also made decisions about the *"shelf life"* of a badge: an expiration date at which time the badge holder would need to be re-assessed to ensure continued mastery.

The next step was the graphic design of the badges. A decision was made for a system-wide template of a basic coin with concentric bands and a ribbon for the badge name. Again, CCCS' chief instructional designer played a lead role in the development of the badge design.

All CCCS badges have the words "*Colorado Community College System*" around the outer rim of the coin. In some cases, a badge may also include a symbol representing the badge's field. The badge template enables the inclusion of additional information as relevant – e.g., in a multilevel badging series, where a specific badge fits.

Badge Platform: Credly

After an RFP process involving a number of different potential platform vendors, the CCCS Task Force chose Credly (https://credly.com) to host CCCS' badges. The Task Force decided that Credly provided the "*best vision*" and economics for the system's digital badging. Credly, one of the leaders in the digital badging movement, is an open-badge-compliant platform that both issues and imports digital badges.[2] The CHAMP grant provided initial funding for the platform's use.

Once a student has qualified for a badge, the information is forward to CCCS's chief instructional designer who inputs it into the Credly platform. An email notice is then generated to the student to claim the badge. If the student accepts, a badge is issued and posted on the student's profile in Credly. The badge with its unique URL specifies the competencies required to earn the badge; the issuing agency; and the evidence of mastery and method of assessment used to ensure competency. As each badge has its own URL, the earner can include an active link on her resume or export the badge to other sites such as a Mozilla backpack or LinkedIn profile.

[2] For more information on the Credly platform, see https://credly.com/faq.

CCCS plans to fund the Credly site for two years after the CHAMP grant sunsets, September 2017, thus until October 1, 2019. Of note, regardless of CCCS's continued use of Credly after 2019, all existent badges will continue to be accessible on the site.

CCCS Badges

In advisory board meetings, industry representatives spoke of the widespread lack of applied math skills among incumbent workers and job seekers. These skill gaps included units of measure; geometric dimensions; and ratios, proportions, and percentages. They stated that workers were unable to calculate the amount of materials they needed for a project or task or configure the dimensions or determine the tolerance of the item they were manufacturing. This led to waste and slowed down production activities. In response, CCCS decided to develop and pilot Technical Math as its first digital badge series. Concurrently, CCCS began work on badges in machining, some of which were based upon NIMS' certifications. In addition, CCCS also began to develop the engineering graphics series of badges. Further, CCCS also developed a number of badges that were inspired by CHAMP activities but were not funded by CHAMP, including badges in Faculty Development,[3] 21st-Century Healthcare,[4] and Colorado First and Existing Industry noncredit training.[5]

In the sections below the CHAMP-funded badges will be discussed in more detail.

Technical Math Badges

Technical math is needed in most advanced manufacturing fields; traditional credentials, however, provide employers little indication of a job applicant's math skills. Several years ago, in response to broad industry need, CCCS developed an online course (specifically, a Massive Open Online Course, or MOOC) called Technical Math for Industry. This MOOC contextualized math skills for industry and had built-in "*concept mastery*" assessments that could be transformed into digital badges. Under the digital badging system, students were only allowed to take the MOOC's topic and subtopic randomized math assessment once. If they earned a grade of 80 percent or higher, they would automatically be awarded a digital badge. The pilot program provided CCCS with a means to introduce both the MOOC and digital badging to employers – often through the CHAMP advisory committees. Table 1 shows the number of badges awarded in technical math in 2016. It should be noted that the Technical Math MOOC was open to anyone in the world with access to the Internet. The numbers in Table 1 therefore include both CCCS students as well as non-CCCS students.

[3] Ten Faculty Development badges were developed and launched in late summer 2016.

[4] Six 21st-Century Healthcare Skills badges were created to be used both with high school and college students.

[5] See https://www.cccs.edu/partnering-for-success/training-funds/ for information on this series of badges.

Table 1. Technical math badges awarded between January 27 and November 3, 2016[6]

Badge	# Awards
Essential Geometry Mastery	15
Essential Statistics Mastery	11
Systems of Equations Skills	23
Math- Angles & Triangle and Geometric Concepts Skills Badge	14
Math- Essential Trigonometry Mastery	9
Formulas and Variation Skills	18
Math-Algebraic Functions Skills Badge	17
Math-Circles & Polygons Perimeter & Circumference and Area Skills Badge	15
Equations and Formulas Skills	17
Math-Essential Finance Mastery	12
Essential Math Mastery	32
Math-Exponential and Logarithmic Functions Skills Badge	13
Math-Exponents, Roots, Powers of 10 & Scientific Notation Skills Badge	32
Math-Finance, Simple and Compound Interest Skills Badge	13
Math-Fundamental Concepts and Operations of Algebra Mastery	27
Graphing Skills	11
Ratio, Proportion & Percent Mastery	2
Ratio, Proportions, and Percent Skills	44
Solving Quadratic Equations Skills	17
Statistics Mean, Median, Mode and Probabilities Skills	14
Math-Trig Functions, Sine, Cosine & Tangent Skills Badge	11
Math-Units & Systems of Measurement Skills Badge	36
Vectors Skills	11
Math-Volume of Geometric Solids Skills Badge	16
TOTAL	430

Note. Data retrieved May 22, 2017, from Credly database.

Machining Level I

The members of the Machining Task Force used the certification criteria set forth by the National Institute of Metalworking Skills (NIMS) as the basis for the series of badges they were charged with creating. As NIMS has well-established industry standards, the identification of

[6] Because the Math MOOC was not offered during the 2016–2017 academic year, no badges were awarded after November 2016.

competencies for these badges did not involve the same level of consultation with industry employers as did the other badge series developed by CCCS (Perea, n.d.).

To earn a digital badge in machining, students had to receive a recommendation from their instructor and successfully complete the associated NIMS test or an equivalent project. Given the use of NIMS' standards, machining students can concurrently earn two credentials—a CCCS badge and a NIMS certification.

One of the benefits of linking a CCCS badge to NIMS certification is that it expands the visibility of students' skill mastery. The digital, open-source CCCS badges enable employers who are not familiar with NIMS or are not part of the NIMS system to use common platforms such as LinkedIn to search for skilled workers (Personal communication, B. Perea, February 24, 2017). The series of 11 Machining Level 1 badges were launched during the spring 2016 semester (see Table 2).

Table 2. Machining Level 1 badges awarded between May 28, 2015 and April 3, 2017[7]

Badge	# Awards
CNC Milling: Operations Mastery	40
CNC Milling: Programming Setup & Operations Mastery	4
CNC Turning: Operations Mastery	38
CNC Turning: Programming Setup & Operations Mastery	6
Drill Press Skills 1 Mastery	10
Grinding Skills 1 Mastery	3
Job Planning, Benchwork & Layout Mastery	10
Manual Milling Skills 1 Mastery	5
Measurement, Materials & Safety Mastery	39
Turning Between Centers Mastery	6
Turning Operations: Chucking Skills Mastery	6
TOTAL	158

Note. Data retrieved May 22, 2017, from Credly database.

Due to the overlap between NIMS certification and digital badges in machining, CCCS allowed students who had already received NIMS certification prior to 2016 to also earn a digital badge. Thus, the navigator at FRCC contacted current and prior machining students to ask them if they were interested in getting a digital badge. If they were, she sent their information to CCCS' instructional designer, who then entered the necessary information on the Credly site. Once the student accepted the badge, that action was posted on Credly.

Engineering Graphics Badges

[7] 2015 totals include the students, mostly from FRCC, who retroactively earned a digital badge based on their NIMS certifications.

CCCS collaborated with its CHAMP four-year institutional partner, Metro State University (MSU), to develop a set of Engineering Graphics badges. MSU began working on its badges first; however, these badges were unique to MSU as they were grounded on competency modules within the university's curriculum. When MSU's badges were complete, their metadata were passed along to the Additive and Subtractive Manufacturing faculty at CCCS to be revised and transformed into that program's two- to four-year Engineering Graphics badges. The CCCS badges were designed to align closely with trainings in specific software needed in manufacturing as well as in the emerging field of 3D printing. At both institutions, CHAMP advisory board members were active in reviewing and developing the badges. The CCCS badges were made available in August 2016; the first badges were awarded in November 2016. MSU's badges were ready for rollout in July 2016 but were not made available until the Fall 2017 term, when the courses with which the badges were aligned were launched.

The CCCS versions of the Engineering Graphics badges were developed by a design task force primarily made up of faculty from FRCC, PPCC, RRCC, CCA, and PCC – including the state discipline chair for CAD. The involvement of the state chair helped to ensure that the badges corresponded to the current Colorado system-wide CAD curriculum.

Given distances, the CCCS team met remotely for six months. First, they reviewed the identified competencies developed for the MSU engineering graphic badges. Then, they considered potential content areas for their badges based on the software that is central to current graphics curriculums. They also engaged in some backward design, comparing two-year college curriculums with MSU's four-year curriculum and the badges that were being designed to support that program.

The CCCS team identified a series of badges that paralleled the competencies covered in a typical two- year college CAD curriculum. This series of Engineering Graphics badges were then reviewed by PPCC's and FRCC's CAD Advisory Board to ensure that each badge's competencies matched what industry required for each badge to be meaningful in the workforce.

Six Engineering Graphics badges were presented at the CAD discipline state meeting in September 2016, then launched. This first batch did not include the SketchUp Mastery badge. That badge was developed and rolled out during the fall 2016 semester, when the task force recognized that SketchUp had the highest enrollment rates of all CAD courses across CCCS colleges.

As part of its 2016 launch, CCCS decided it would review all its Engineering Graphics badges over the summer of 2017. This review will involve employer feedback about each badge. It will also examine to what extent the badges continue to align with specific competencies and signify the degree of mastery. Adjustments and modifications will then take place for the next generation of Graphics Engineering badges.

Currently, depending on the specific badge, most Engineering Graphics badges roughly equate to a student completing one or two courses. To be awarded a badge, a student must complete the related coursework with a grade of 80 percent or higher, or have a project portfolio reviewed by faculty to determine mastery of specific competencies. However, badges are not awarded automatically for course completion; instead, students must explicitly request a review of their transcript or portfolio. CAD faculty have begun advertising the availability of the badges in emails to students enrolled in courses associated with them, letting students know there are opportunities to stack a number of badges as they pursue a certificate or associates degree.

To date, the vast majority of badges have been awarded for AutoCad 2D, followed by AutoCad 3D mastery (see Table 3). FRCC reports that the majority of their badge recipients are CAD program students, though they have awarded some badges to interior design and architecture students.

As described above with regard to machining, CCCS permitted the colleges to notify students who had taken the relevant coursework within the prior year to invite them to earn a digital badge. Interested students were then assessed for one or more badges, which were awarded to those who demonstrated mastery.

The distribution of the Engineering Graphic badges developed by both CCCS and MSU, and the number of each badge awarded to date, can be seen in Table 3.

Table 3. Number of engineering graphics badges awarded, by awarding institution

MSU Denver		CCCS **(7/5/2016 5/1/2017)**	
Badge	**# Awards**	**Badge**	**# Awards**
Foundations of Composite Materials Mastery	2	**3D Printing & Additive Manufacturing Mastery**	1
3D Scanning Mastery	0	**3D Scanning Mastery**	1
Design for Metal Additive Manufacture Mastery	0	**AutoCAD 2D Mastery**	55
Metal Additive Manufacturing Post Processing Mastery	0	**AutoCAD 3D Mastery**	11
Composite Repair Skills Mastery	0	**Revit Basics Mastery**	1
Composite Testing Skills Mastery	0	**SketchUp Mastery**	2
		Solidworks Mastery	0
TOTALS	2		71

Note. Data on awards made to CCCS students retrieved May 22, 2017, from Credly database.

The Use of Badges

To date a total of 72 badges have been created by CCCS and MSU, and a total of 535 badges have been awarded to 202 unique individuals. As of July 25, 2017, the badges have had over 91,200 views "either by direct URL to the participants' specific badge or through social media (13 percent shared through Facebook, 78 percent shared through LinkedIn, and 9 percent shared through Twitter)" (Personal communication, B. Perea, July 2017).

As noted above, digital badges can increase the visibility of students and the specific skills they have mastered – thereby increasing their marketability. Digital badges can also increase employers' ability to identify individuals who have the blend of skills needed to thrive in the workforce. In addition, digital badges can help incumbent workers add to their qualifications by showcasing professional development that has taken place since being hired (CCCS, n.d.).
In addition to benefits related to employment, digital badging has been found to be helpful within academic institutions. Through their codification of competencies and mastery, digital badges make explicit the skills contained in a course or program of study. This transparency in the awarding of credits can help students transition from certificate to degree programs. Badging also simplifies credit granting for courses students take at other CCCS colleges if their home institution does not offer a specific course. For example, PPCC does not have a CNC lathe course, so students needing that course must enroll in another consortium college and then transfer those credits back to PPCC. Further, digital badges can facilitate the transfer of students to other colleges.

Badges, like PLA credits, can provide students with a sense of achievement and motivate them to continue their studies, thereby affecting retention (CAEL, 2010). Further, given industry's recognition of badges, they can also be useful for employment before, or even instead of, completing a certificate or degree.

PART IV: EARLY FEEDBACK

Reception to Badges

Faculty

Digital badges have been conceived by participating CHAMP colleges as supplements to, rather than replacements for, existing certificate programs. However, faculty at some colleges were concerned that digital badging may eventually be transformed into an independent credentialing process. These faculty members worried about how the expansion of digital badging would affect enrollment in their certificate and degree programs.
A number of faculty observed that not all curriculum can be segmented into skill sets conducive to badging. The stacking of certificates in these courses or programs (e.g., LCC's welding program) were thought to be far more valuable for students and industry.

Despite these reservations, most of the staff and faculty involved with badging were optimistic about the future potential for badges in the advanced manufacturing industry.

> *It's very simple for them to go onto LinkedIn and see somebody's profile. And then click on a badge they have a discipline in (sic).*

Students

During site visits to CHAMP colleges conducted in fall 2016, we found that the majority of students we spoke with were not yet aware of the availability of digital badges or how best to utilize their earned badges as they seek employment.

Information about badging is often only presented after a student has enrolled in a course associated with a badge. For example, at FRCC, the CAD instructor sends an email every semester to students enrolled in CAD courses to make them aware of the Engineering Graphics badges and the process of earning them.

As the initial development phase of badge creation concludes, some colleges, such as FRCC, are beginning to sponsor training programs or workshops about digital badges so students understand better what digital badges are, how badges can help them with their job searches, and how they can use badges to expand their portfolio.

As is clear from the number of badges earned to date, CCCS students have begun to participate in the badging process. Unfortunately, EERC did not have the opportunity to interview any badge recipients about their experiences with earning and using digital badges.

Employers

Despite some industries' and employers' increased use of badges to recognize professional development or to manage their talent pool – e.g., IBM, Fossil, Home Depot, Bank of America, Hunter Douglas, Walmart, Google, Microsoft, Time Warner Cable (Perea, Chieppo, and Woodmansee, n.d. p. 5) – reception to the new CHAMP-created digital badges has been mixed. Indeed, when we interviewed several employers already associated with the CHAMP grant during the spring of 2017, we found that most were not aware of the colleges' digital badging efforts. As a result, this section focuses on interviews with faculty and staff and their views on the interest and awareness of badges among their industry partners.

In interviews with EERC, some faculty and staff shared that from their perspective the push to develop digital badges came much more from the academy than from industry. One project lead stated,

> *We just don't have a lot of industry push for it right now. They really don't care. They want somebody to go through this. . . class. Right now, it's still the certificate that we get. And so we just haven't crossed over on that wake yet. . . [,] we haven't heard back from our advisory*

> *organizations yet, and our industry experts, to say we need this badge in this area. They just want the training in this area.*

Another interviewee noted that there may be a mismatch in nomenclature – a failure to communicate:

> *We call them something [badges], but industry doesn't understand what we're calling them. Even though it might be the same thing they're looking for. They might – it's not in their lingo, [so it] needs to be changed.*

One project lead summed up the challenge that they are facing with rolling out badges to industry:

> *Many of the businesses [don't have an appreciation] as to how badging works, and how it can work for them, and how they can use this to verify their [applicants' or employees'] credentials in their skill sets.*

Another commented, *"the skills and applicability of the credential must be immediately apparent or some of their value is lost."*

Like anything new, colleges are recognizing the need to commit to an ongoing educational process that explains to employers what digital badging is and how it can benefit them. To facilitate this educational process, CCCS has created pamphlets, videos, and a website with an FAQ about digital badges.

The CHAMP colleges say they are beginning to see these educational efforts gaining traction as employers are expressing more interest. For example, PPCC's project lead noted that members of that college's advisory board, such as Lockheed Martin and Sythes, "*really like the idea.*" Another project lead made the link between digital badges and the current interest in competency-based education:

> *Eventually badging will have a greater meaning for the employer, based on competencies. So I think it really goes strongly with the trend of competency-based education. And it will be a more concrete format for an employer to understand competencies.*

In fact, despite some industry employers stating a continued preference for traditional credentialing – i.e., the pursuit of certificates and degrees – digital badging has opened up new possibilities on the noncredit side. The CHAMP project lead at AIMS reflected,

> *When I first started under the TAA grants, somebody had mentioned badges and those type of things. That was coming from educators . . . trying to push it down on employers and stuff. Now we are hearing from manufacturers that they might want those badges because they want quicker turnaround for training and stuff.*

It is not clear to what extent industry has begun to move to a tipping point where badging is more acceptable if not encouraged. Nonetheless, to meet their industry partners' interest in accelerated credentialing, Aims is currently working with them to develop digital badges for the college's noncredit offerings.

Four-year colleges are also beginning to award badges in their noncredit training (Personal communication, B. Perea, June 15, 2017) in response to industry's interest in skill upgrades for incumbent workers and to identify new workers capable of operating new technologies. As noted above, these endeavors have also raised concern about the effect of badging on credit and noncredit program enrollments at both four- and two-year colleges.

PART V: THE FUTURE OF BADGING

CCCS staff have expressed some concern that they are "*in a bubble*" with regard to digital badging. They believe that if there is not a sustained, systematic effort to create a system of badging across and between the various system colleges, the gap will be filled by for-profit educational opportunities – and community colleges will potentially be disadvantaged in the emerging competition. CCCS therefore wants to grow and support the digital badging "*ecosystem*" after CHAMP ends in September 2017.

To that end, CCCS secured funding for the Credly platform through September 2019 and recently established a new position: Director of Workforce Development. This individual will have overall responsibility for the digital badging project, including the employment of an instructional designer who will directly oversee badging activities within the system (Personal communication C, Perea, June 15, 2017). In this way, CCCS staff will maintain the centralizing and guiding functions they carry out under CHAMP, including their work to prevent the creation of duplicative badges (Personal communication A, Perea). Several CCCS colleges that are not part of this study are also developing new sets of digital badges. For example, Trinidad State Community College is working on badges in gunsmithing, drone analytics/GIS and agribusiness. Colorado Northwestern Community College is developing badges in heavy equipment and civil engineering with the help of three diverse industries: excavation, power plant, and construction. Arapahoe Community College is developing badges in LEAN manufacturing.

Further, FRCC's Fort Collins campus has begun to credential their co-enrolled high school students with badges. The college is also discussing the development of a "professionalism" badge to reflect the (CHAMP-developed) addition of soft skills to their advanced manufacturing curriculum.

In addition to these activities, colleges continue to work with their industry partners to refine their badges. For example, they are examining the advantages and liabilities of assessment processes (e.g., exams, projects) and are considering whether and how to evaluate individual performance in group projects. They are also exploring how the stacking of badges might create new types of certificates.

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