Competency-Based Digital Badges and Credentials: Cautions and Potential Solutions From the Field

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Abstract: This paper explores tensions that repeatedly surface alongside significant advances in instructional technology. One such recent advance concerns open digital badges that contain specific claims of competency and detailed evidence supporting those claims. Some assume that badges should only contain claims and evidence concerning specific measured competencies, while dismissing badges for participating in courses or activities that lack such evidence as "attendance badges." Others assume awarding badges only for measured competencies bypasses very important forms of social and inquiry-oriented learning, ignores the limitations of assessment and measurement, and limits the transformative potential of web-enabled evidence-rich credentials. An extended study of the 29 projects in the 2012 *Badges for Lifelong Learning* initiative provided a unique opportunity to explore this enduring debate. None of six efforts to create competency-based open badge systems resulting in thriving ecosystems.

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Keywords: digital badges, metadata, competency-based education, constructivism

Introduction

Each wave of advances in educational computing brings to the surface an enduring debate between two very different views of learning. Shortly after the graphical computer interface was introduced in 1961, the PLATO system was introduced at the University of Illinois. PLATO was primarily used to deliver programmed instruction in the behaviorist mastery-learning model that was widely accepted in era (e.g., Anderson, Kulhavy, & Andre, 1971). Six years after PLATO was introduced, Papert and colleagues at Bolt, Beranek and Newman introduced the LOGO programming language (Niemiec & Walberg, 1989). LOGO was based on the cognitive developmental theories that were just coming to light among western educators and psychologists, and was intended to allow learners to discover programming concepts such as recursion and develop critical thinking skills. In Papert's vision, "…the child programs the computer and, in doing so, both acquires a sense of mastery over a piece of the most modern and powerful technology and establishes an intimate contact with some of the deepest ideas from science, from mathematics, and from the art of intellectual model building" (1980, p. 5).

In practice, the divide between these approaches to educational computing was not always so clear, and many innovators resisted being essentialized. For example, Alpert and Bitzer (1970) insisted that PLATO was not limited to programmed instruction in basic skills but was also fostering inquiry and critical thinking. Nonetheless, moving forward into the personal computer era, publishers, parents, learners, and librarians had the choice between drill and practice programs like MathBlaster (Eckert & Davidson, 1987) and more discovery-oriented programs like the Logical Journey of the Zoombinis (Brøderbund, 1996) which was designed to support logical reasoning and critical thinking. While this tension simmered as online and hybrid instruction became more common (see Koszalka & Ganesan, 2004), it leapt to prominence with the emergence of massive open online courses (MOOCs). The initial "cMOOCs" emphasized knowledge construction and connections in emerging "connectivist" models of learning (Siemens, 2005). But the later "xMOOCs" like edX and Coursera featured streaming videos, structured practice problems, and multiple choice tests. The very scalable instructional model and limited peer interaction in xMOOCs allowed for the dramatic expansion of free online learning opportunities, leading the New York Times to dub 2012 "the year of the MOOC." However, the static instructional model was a most frequently cited concerns in the "backlash" that followed (Kolowich, 2013).

This tension can be traced back to two very different views of cognition. PLATO, MathBlaster, and xMOOCs all assume disciplinary knowledge can be readily broken down into smaller associations that readily "reassemble" into more sophisticated higher order knowledge; such assumptions support instruction that efficiently trains and tests these specific associations. While some label such approaches as "behaviorist," this is usually not appropriate. Many modern information processing models of human cognition also focus on specific cognitive associations as well. Hence, a more appropriate label for these approaches is "associationist." Conversely, LOGO, Zoombini, and cMOOCs assume knowledge primarily consists of higher order conceptual "schema" that differ from learner to learner and are constructed via inquiry and problem solving. This calls for exploration and discovery that helps learners construct new knowledge. While this perspective is often labeled "cognitivist," this is also generally inappropriate; the label "constructivist" or Papert's term "constructionist" more accurately capture the focus on having students construct new conceptual knowledge; the term "connectivist"

captures the additional assumption in the cMOOCs that learners are doing so by digitally connecting with others. While these assumptions are tacit among many educators, the distinction between associationist and constructivist perspectives is widely appreciated in the Learning Sciences and among educational researchers more generally (e.g., Greeno, Collins, & Resnick, 1997) and has been the subject of vigorous debate (e.g., Kirschner, Sweller, & Clark, 2006 vs. Hmelo-Silver, Duncan, & Chinn, 2006; Tobias & Duffy, 2009)

Associationism vs. constructivism in new learning technologies

These tensions are taking on new importance as they surface within three related developments. The first is renewed interest in *competency-based education* (CBE). One proponent described CBE as "having a curriculum structured to demonstrate learning in clearly articulated competencies, is often self-paced, is agnostic as to the source of learning while maintaining clear and transparent learning standards" (Leuba, 2015, p. 1). While eschewing the radically reductionist approach of earlier mastery learning models (e.g., Guskey & Gates, 1985) with a focus on "authentic" and "real-life" demonstrations and projects, modern CBE models still focus on individualized mastery and demonstration of specific knowledge and skills, as opposed to completing activities or courses with other learners. Proponents of CBE put it in opposition with the prevailing credit-hour models, deriding the latter as "'time-served' rather than learning achieved" (Laitinen, 2012, p. 5). Another departure from earlier mastery learning models is that many current CBE models also "personalize" learning by giving students choices in how they gain and demonstrate their competencies (i.e., "agnostic as to the source of learning"). Within efforts to individualize learning with digital technologies, CBE has gained significant support from the US Department of Education, publishers, and major US Foundations. For example, the Gates Foundation's *Project Mastery* initiative supports K-12 implementation of "proficiency-based pathways" which offer "opportunities for students to engage in a learning experience where they can demonstrate mastery of content and skills and earn credit towards a diploma, certificate, or some other meaningful marker" (Gates Foundation, 2014, p. 7). In the United States, although just taking hold in K-12 schools, CBE is already being used to structure entire universities (e.g., Southern New Hampshire University) and is entrenched in many professional vocational education sectors (e.g., healthcare and aviation). While concerns over "seat time" are mostly North American issues, a recent survey found noteworthy uptake of CBE around the world (Bristow & Patrick, 2014).

CBE is not without critics. A report from the Carnegie Foundation (the originators of the "Carnegie Unit") provided perhaps the most comprehensive recent critique. Reflecting the underlying tensions introduced above, the report argued that "by focusing on the acquisition of discrete skills," CBE "may make it more difficult to promote inter-disciplinary teaching, collaborative learning, and other instructional strategies that the latest research in learning science encourages—and the deeper, integrative learning that flows from those instructional strategies" (Silva, White, & Toch, 2015, p. 27). The report went on to summarize concerns that observers have raised regarding CBE, including: (a) CBE has the potential to widen achievement gaps, (b) the differentiation of instruction for individuals creates new challenges for educators, (c) it is expensive to implement, and (d) it overlooks the very real limitations of assessment and measurement.

A second recent development in learning technology is the advent of *open digital badges*. Launched by the MacArthur and Mozilla Foundations in 2011, this new web-enabled vision of credentialing has captured a good deal of innovation and attention (e.g., Carey, 2012). *Digital* badges can contain specific claims of learning, evidence to support those claims, and hotlinks to more evidence such as completed student work. *Open* digital badges can readily circulate in social networks and are interoperable with other learning management resources. The transparency associated with web-enabled credentials causes issuers, earners, and consumers to deliberate more about the nature of claims and the validity of the evidence than with conventional static credentials (whose credibility was derived from the issuing institution and its accreditation). This means that the introduction of open digital badges in educational ecosystems can be quite disruptive (Casilli & Hickey, 2016)

As with CBE, tensions that can be traced back to associationist and constructivist views of learning emerged around digital badges. Some viewed badges as an extension of CBE, insisting that the claims and evidence inserted in badges should contain measurable and (ideally) measured competencies. At the 2011 kickoff of the *Badges for Lifelong Learning* competition, US Secretary of Education Arne Duncan stated that digital badges "can help speed the shift from credentials that simply measure seat time to ones that more accurately measure competency, and we must do everything we can to accelerate that transition" (Duncan, 2011). Conversely, other influential commentators dismissed digital badges as behaviorist extrinsic incentives (e.g., Jenkins, 2012; Resnick, 2012). Badge proponents responded by pointing out that people could simply avoid using them as arbitrary extrinsic rewards for learning. Ravet (2014) raised this issue in the context of using badges to support a European effort to promote *Key Competencies for Lifelong Learning*. He argued against what he called "normative" badges awarded for mastery of specific competencies by articulating the more general worry that many constructivist researchers have with highly specific standards: "But there is one more fundamental problem

with standards, not with the standards as such, but with those who think that standards are the alpha and the omega of everything, letting standards be the proverbial tail wagging the dog" (p. 24). Rather than motivating compliance, and presumably undermining creativity and innovation, Ravet argued for "achievement badges" that are delivered *after* something has been achieved: "Achievements badges, contrary to key competency badges, do not have to be not normative. Created along the learning pathway, they can be designed with the learners rather than for them. As they can be created post-facto, they do not bear the stigma associated with the use of Open Badges as extrinsic motivators." Ravet elaborated that the "beauty of achievement badges is that they capture the context of the achievement in the criteria: where, how, what resources, etc. And the collection of achievement badges creates a fabric of interwoven threads of narratives: one's own story is interconnected to others' stories through achievement badges (2014, p. 25).

This position directly follows from self-determination theory (particularly, Kohn, 1999). But the larger notion of badge-based pathways around more social forms of learning and recognition represent the underlying influence of contemporary sociocultural theories of learning (i.e., Yowell and Smylie, 1999) that helped shape the MacArthur Foundation's introduction of open digital badges. In key ways, open digital badges nicely capture the tension between associationist and constructivist approaches, as well as the potential for the newer sociocultural perspective to point out a path forward. As shown below, a two year study of the 29 project funded in the aforementioned *Badges for Lifelong Learning* initiative was a useful context for exploring this potential.

A third relevant development in learning technologies is the ongoing effort to define *metadata* standards for educational information. Metadata is "data about data." Efforts have been underway for years to come up with common standards for labeling and characterizing the vast quantities of information generated by e-learning systems (e.g., Bohl, Scheuhase, Sengler, & Winand, 2002). This work has taken on new importance with the use of learning management systems (LMSs) in nearly every college and university and many K-12 schools to support online, hybrid, *and* conventional classroom learning. Many in the Learning Sciences community are just beginning to appreciate the scope and implications of current efforts to develop educational information architecture standards. Proponents argue that these standards are necessary to support the inter-operability needed to allow learning technologies (including LMSs, applications, analytic tools, content, learner records, and credentials) to take full advantage of the Internet. As anyone who has tried to innovate within a comprehensive learning management system knows, the systems necessarily make assumptions that constrain options.

Much of the current information architecture work is being carried out by *IMS Global Learning,* a consortium of publishers, technology providers, schools, and policy makers. IMS Global's new *Learning Tools Interoperability* (LTI) standards are already doing for LMSs what external apps do for smart phones. Consider, for example, digital badges. Issuing badges from within earlier LMS's would have required massive amounts of programming and significant changes to the core program for each LMS. As of fall 2015, there are at least three LTI-compliant external applications for issuing digital badges (*Badgr* from the Badge Alliance/Concentric Sky, *BadgeSafe* from Accreditrust, and *BadgeOS* from Credly). Each is competing to offer desired functionality and serve different clients. Arguably, the existence of such standards and the ability to readily use and refine external applications are crucial for advancing the nascent digital badging community. IMS recently launched a project to develop a "currency framework" for digital badges that aims to "further the adoption, integration, and transferability of digital credentials within institutions, schools, and corporations" (IMS Global, 2015) (1). Likewise, similar efforts are underway by foundations and higher education associations to create common standards for "connected digital credentials" more generally. For example, one effort promoted by the American Council on Education argues that a "common DNA" is a critical ingredient in quality digital credentials. The effort cites research showing that that "all of the types of credentials in use—degrees, certificates, certifications, licenses, badges, etc.—can be described in the same language of competencies: the level of knowledge and specialized, personal, and social skills the credential represents" (Ganzglass & Good, 2015).

The tension between associationist and constructivist views of learning do not appear as obvious in efforts to standardize metadata for educational technologies and credentials. Given that education has primarily been organized around credits, the current standardization efforts include efforts to broaden technologies and credentials to support competency-based approaches. Leuba (2015. p. 1) describe a recent pilot effort to overcome these limitations, attempting to change the fact that "the products used to manage our institutions and the teaching and learning process are all deeply rooted in the credit-hour based, term-based, and course-based educational delivery model". Initially, it seems, these efforts to standardize metadata and credentials will simply include things like "social skills" and "critical thinking" that are paramount to constructivist innovators as additional competencies to be categorized and measured and/or observed. As illustrated next, doing so within efforts to introduce digital badges systems may be more challenging than innovators expect.

Relevant findings from the Design Principles Documentation Project

The Design Principles Documentation (DPD) project was tasked with capturing the "practical wisdom" that emerged across the 29 diverse badges development efforts funded in the 2012 Badges for Lifelong Learning initiative, with the support of the John C. and Catherine T. MacArthur Foundation's Digital Media and Learning initiative and the Gates Foundation's Project Mastery initiative. In an elaborate competition, over 600 proposals were reviewed and the 29 winners were granted approximately $200,000 and partnered with one of several badge system developer awardees to develop a badge system over a one-year period as the Open Badges Infrastructure standards and various supporting technologies were being developed by the Mozilla Foundation.

The DPD project first analyzed the content of 29 funded proposals to identify four categories of *intended practices* for digital badges: *recognizing* learning, *assessing* learning, *motivating* learning, and *studying* learning. The project then followed the 29 projects, conducting periodic interviews with project leaders to determine which of those practices each project was able to enact and what difficulties they ran into. In 2014 (after all of the new funds had been exhausted), the project carried out follow-up interviews to determine which practices were maintained, the final status of the badge system relative to the one articulated in the original proposal, and the final status of the larger badge-oriented "learning ecosystem" envisioned in the proposal. By clustering the more specific practices across projects into more general design principles, the DPD project was able to generate a wealth of knowledge about which principles were easier to implement and which principles were harder to implement. In 2015, the DPD project followed up to determine which ecosystems were still "thriving."

The DPD project did not set out to study competency-based badge systems. However, seven of the 29 awardees (including three of the awardees funded by Gates' Project Mastery) had proposed to develop badge systems for individualized self-paced mastery of specific competencies. As such, the DPD project was presented with a unique opportunity to examine the success of competency-based badge systems and related badge design principles. Before considering how these particular projects fared, it is worth noting that only 16 of the 29 projects succeeded in establishing the badge system they originally proposed, while 8 of the projects were judged to have established a different badge system than the one they proposed; 5 of the projects did not build any badge system.

Sustainable Agriculture and Food Systems (SA&FS) proposed to build its open badges system within a larger effort to develop a new competency-based interdisciplinary major in the College of Agriculture and Environmental Sciences at the University of California-Davis. As was widely reported in the educational media, SA&FS proposed to issue badges within a sophisticated custom e-portfolio system with comprehensive scoring rubrics, and was based on "a model of learning, participation, and assessment focused around high-level 'core competencies' that bridge classroom and real-world experiences, academic investigations and concrete skills" (2). As with many CBE projects, SA&FS carried out extensive research to document the specific competencies that employers who might hire their graduates were seeking. However, the competency-based initiative ultimately failed to gain the wider support of the university needed to sustain it and the project ultimately only managed to create a few test badges. The staff member who was spearheading the competency-based system left UC Davis and the new major was established as a conventional course-based program (3).

The *Pathways to Global Competence* badge system was proposed by the Asia Society, a New York-based non-profit that was also implementing its curriculum in dozens of US secondary schools with a *Project Mastery* grant. Like SA&FS, they attempted to build an open badge system around a sophisticated e-portfolio system; however, they proposed to do so in partnership with a commercial e-portfolio provider (ShowEvidence, Inc.). The project proposed to award *Global Leadership* badges to secondary students once they earned four global competency badges. For example, one of these four badges was for *Generating Global Knowledge.* Students were to earn this badge by submitting an e-portfolio that outside experts confirmed as evidence the student could "initiate investigations of the world by framing questions, analyzing and synthesizing relevant evidence, and drawing reasonable conclusions about globally focused issues." (Asia Society, 2011). However the additional resources that were reportedly needed to establish the badges and the new e-portfolio system were not secured and both software development efforts encountered serious challenges, and the badge system was never developed. However, the competency framework and scoring rubric was implemented and is presumably still being used in most of their partner schools; an evaluation of the Project Mastery awardees found that many teachers reported having students develop their portfolios using Google Docs (Steele et al., 2014).

The *LevelUp* badge system was proposed by a partnership between the Adams County District 50 School System in Colorado, EffectiveSC, and Intific, Inc. Adams 50 was in the midst of a comprehensive effort to reform several of its underperforming schools using CBE with the support a Project Mastery grant. EffectiveSC was a non-profit that was developing the open-source *LevelUp* personalized competency tracking platform. Illustrating the technology challenges summarized by Leuba (2015), LevelUp was intended to streamline CBE by serving as "middleware" between the district's existing *Educate* student information systems and online instructional resources where students could develop and demonstrate their competencies. Intific is a Texas software

development firm that was funded to develop four *Space Wolf* competency-based "learning progression games" that were to play a central role in the Adams 50 mathematics reforms. The project proposed to use the LevelUp platform to allow competencies that students developed playing the games to be automatically transferred to the *Educate* system. However, technology challenges with LevelUp and Educate and intellectual property issues kept that badges system from progressing beyond an initial pilot and it was suspended. According to participants from EffectiveSC, another obstacle was that the districts commitment to CBE declined sharply once the Project Mastery funding had expired and major technology challenges continued to frustrate teachers, students, and parents. These observations were generally confirmed in the external evaluation by Steele et al. (2014) which also reported statistically significant declines in math achievement in the participating schools (see also Sturgis, 2014).

The *Youth Digital Filmmaker Badge System* was proposed by the School District of Philadelphia, who partnered with the Youtopia's commercial badging/gamification platform and the Philadelphia Youth Network. The badge system was part of a larger Gates Project Mastery initiative that also aimed to enhance the district's *SchoolNet* LMS (from Pearson corporation) and its *Pathbrite* e-portfolio system to better support competency-based learning by allowing teachers to award course credits for competencies demonstrated in non-school projects. The badge system specifically aimed to foster afterschool "extended learning opportunities" around a new youth filmmaker program designed to "support academic credit attainment, anytime/anywhere learning, and skills mastery tied to Common Core State Standards for English and Language Arts." More specifically, the project goal was "diversifying the ways and locations in which students can demonstrate mastery of critical reading, writing, and communication skills via multiple options to publish and produce films." To support these goals, the project proposed to develop detailed scoring rubrics that would allow external agencies to endorse the badges, external experts to review storyboards, scripts, and videos for evidence of competencies, and teachers to award students formal academic credit for those competencies. However, significant technological challenges were encountered with all three new technologies. Additionally, the project failed to secure external endorsements for its badges and some of the teachers in the badges pilot project were reportedly reluctant to award formal course credit for the youth filmmaker badges. All three systems were paused after a single pilot.

The *National Manufacturing Badge System* was developed by the non-profit Manufacturing Institute in partnerships with *SkillsUSA*, a workforce development agency and with *Project Lead the Way* (PLTW), a national STEM curriculum-development initiative. The partnership with SkillsUSA aimed to issue badges for secondary vocational students in automated manufacturing programs who also attained passing scores on standardized performance-based assessments developed by SkillsUSA for industry-defined competencies. In this way, the project proposed to create "efficient competency-based pathways to careers" by integrating standardized assessments of industry-endorsed competencies into existing course-based educational programs. In this respect, the project has proposed the sort of education reform that many CBE proponents have been calling for. The project succeeded in creating a system for offering an Automated Manufacturing Technology badge for vocational students who passed the SkillsUSA assessments. But, the project abandoned its plan to offer "leveled" badges that recognized mastery of the more specific competencies (reportedly because they concluded that such a profusion of badges would confuse employers) (4). Instead the criteria for earning the final badge was attaining a passing score on all of relevant SkillsUSA assessments. Unfortunately, the project was unable to secure formal endorsements from manufacturers who would hire badge earners (reportedly because they wanted to first "see somebody who had earned the badge who could do the job"). This endorsement was necessary to convince educators to incorporate the assessments into their courses; without it, the project stalled at the pilot testing stage.

The other Manufacturing Institute badge project was a Computer Integrated Manufacturing badge for students at partner schools who completed PLTW's standardized curriculum and attained a passing score on PLTW's end of course assessment. However, other than the endorsement of the Manufacturing Institute, the badge did not contain any additional evidence beyond the formal credential issued by the schools. While the badge is still being offered by this partnership in 2014, the project leader reported that few, if any, of the potential earners were claiming the badge; while the badge was still being offered in 2015, we found no evidence it was thriving.

The *Young Adult Library Services Association (YALSA)* badge system was proposed to recognize mastery of YALSA's Competencies for Serving Youth in Libraries (5). This included 48 specific competencies in seven areas, including social media, collection building, and public outreach. YALSA first attempted to create seven "pie badges" that displayed which of the sub-competencies that each earner had demonstrated. However, this proved technologically challenging and was set aside in lieu of badges that were issued once mastery of all of the competencies had been demonstrated. The project encountered significant challenges in establishing its website and was forced to scrap its initial system and state anew with a second web development team. They ultimately created a sophisticated system for peer assessment of the artifacts earners were asked to submit in order to earn the badges. However, in 2015, project leaders reported that few were attempting to earn the badges and concluded that the amount of work required to earn even a single badge was apparently too great given, given that there were

no specific incentive or opportunity associated with earning it. They reported that their advisors encouraged them to make sure that the badges were "really valuable."

The *Buzzmath* badge system was proposed by ScoLab, a small educational software firm in Montreal. They proposed to issue badges to recognize mastery of specific competencies as learners progressed through a drill and practice game for middle school mathematics (akin to MathBlaster). The firm used the grant to develop the badges as well as the larger Buzzmath platform. The project succeeded in building both the platform and the badges and aligning both to Common Core math standards. The system has proven to be a commercial success and continues to thrive; an independent evaluation showed that students and teachers believe that playing the games had a positive impact on math achievement and understanding (Morrison, Ross, & Lusiczka, 2015). However, privacy concerns precluded the use of web-enabled *open* and a planned peer tutoring system (the use of emails addresses as identifiers violate the stipulations of the US Children's Online Privacy Protection Act). They were also unable to secure external endorsements of their badges by schools or the organizations the established the educational standards their badges were aligned to.

Summary and conclusions

In summary, only none of the seven projects that attempted to build badge systems around self-paced mastery of highly specific competencies succeeded in creating a thriving open learning ecosystem--BuzzMath succeeded in building a system that used non-open badges as tokens in a drill and practice program. The reasons the other projects struggled were varied. Certainly, the blame cannot be placed entirely (or in some cases even partly) on the decision to implement a competency-based system. Put differently, the DPD project did *not* conclude that these projects would have been more successful had they attempted to issue "time-based" badges based on participation in courses or other education activities. Nonetheless, these projects suggest care and caution is needed when developing competency-based badge systems. In particular, it seems competency-based systems should anticipate the challenges that the DPD project uncovered as well as the tensions in CBE implementations reported in the separate evaluation of the three Gates' Project Mastery initiatives (Steele et al., 2015). These tensions included *equating evidence from anytime/anywhere learning with conventional criteria, determining who can authorize credit, maintaining a common definition of proficiency, building a sustainable model, technical barriers to efficiency, financial barriers to efficiency, logistical barriers to efficiency,* and *promoting equity.* In key ways, these conclusions bolster the concerns in the aforementioned Carnegie Foundation, report, while also highlighting the challenges that student information systems present for CBE summarized by Leuba (2015).

Consider for example, the tensions over equating evidence and authorizing course credit. As mentioned previously, one of the three teachers in the Youth Filmmaker pilot was reluctant to accept the badges for course credit. The Rand evaluation reported project leaders were surprised by this reluctance given the efforts they had taken to align their badges to the Common Core standards. The Rand Report explained that the teacher was not convinced "that the persuasive writing skills appropriate for script development of a documentary film were the equivalent of what he expected students to achieve in a persuasive essay, especially in terms of issues like essay structure and sentence structure." The report went on to state that the teacher "believed that preparing a short nonfiction film and preparing a persuasive essay tapped different skills, both applicable to the real world, but not interchangeable" (Steele et al., 2014, p. 42). After examining the curriculum and the relevant standards, the report concluded the teacher's position "seems reasonable." They also reported concerns such as privacy and validity led all three of the Project Mastery projects to abandon their plans to use external expert arbiters of credit; in the case of the Youth Filmmaker project, this eliminated the intended expert feedback, a key element of the envisioned learning ecosystem. The Rand evaluation reported that Asia Society teachers "found it difficult to get district approval to turn school-led travel experiences into course credit" (p. 42) and that some resorted to substantial measures to bypass their school districts course-based policies and information systems.

The tensions over equating and authorizing gets at the heart of the CBE's "agnosticism" regarding the source of learning. For many assessment researchers and validity experts, this assumption is untenable. This is because an assessment system *must* take into account for the way individuals prepared for that assessment if the resulting evidence is to provide valid evidence to support claims of competency. This is because two different individuals can attain the same score on a given test or produce portfolios or other artifacts that earn the same score via very different paths. Compare, for example, an individual who has prepared narrowly for a particular assessment by memorizing the specific associations (correct and incorrect) represented by the various items with an individual who has completed a broader course or learning pathway that was not focused on those associations. If both individuals get the same score, the second individual is almost certainly more knowledgeable than the first, because of all of the other new knowledge that the assessment could not capture. Likewise, consider an individual who creates an e-portfolio following very detailed guidelines and has access to the scoring rubric and

individualized feedback on drafts against the rubric. This individual almost certainly is less competent than an individual who submits a similarly-scored e-portfolio developed without access to this information and feedback.

This concern with "teaching to the test" is what the validity expert Samuel Messick (1994) labeled "construct-irrelevant" easiness. Hickey and Zuicker (2013) argued that this phenomenon has always been more insidious and much more complex than many educators and innovators realize. Caution seems called for given (a) the compromise and cheating made possible by new digital devices and social media and (b) the disdain for multiple-choice achievement tests and embrace of performance-based and portfolio assessment among CBE and digital badge proponents. Take, for example, the seemingly sensible practice of awarding badges and credit for "anytime/anywhere" learning for passing "scenario-based" performance assessments. Once such information is circulating freely in professional social networks, it becomes substantially easier for vocation educators and potential test takers to figure out precisely what scenario is used in the assessment and potentially the specific questions asked. Unless the assessment includes dozens of scenarios and hundreds of questions, it cannot possibly cover the entire range of competencies. Such concerns certainly give credence to the concerns constructivist educators and proponents of time-based credentials have for strict competency programs. Messick introduced raised this issue of construct-irrelevant easiness in the context of the large-scale K-12 performance and portfolio assessment reforms that came (and largely went) in the 1990s. Concerns over validity and lack of promised positive consequences for teaching and learning were major reasons for the rollback of this earlier wave of assessment reforms. As a kind of assessment reform, it seems that CBE should attend to this issue as well.

Arguably, newer sociocultural perspectives that provided much of the impetus for introducing digital badges offers a potential path forward. As argued by Hickey (2015), sociocultural approaches to assessment and validity tend to focus primarily on communal participation in social practices, and only secondarily on assessment of individual knowledge and skill. This allows these practices to treat all forms of individual assessment as "secondary" kinds of evidence—special cases of primarily social learning. When coupled with contemporary design-based research methods that guide iterative refinement of communal participation, this makes it possible to treat individual performance on the entire range of assessments and tests as evidence of the success of those refinements. An initial examination of two project whose badge systems are particularly thriving (the *Support to Reporter* youth journalism project and the *MOUSE* youth network manager mentoring program) supports this belief. Both issued what might best be described as "role-based" badges. While the badges included claims of specific competencies, the evidence of these competencies was primarily the earner's participation in workshops and other activities with peers and endorsements by experts and peers. Rather than creating a comprehensive list of competencies and assessments in advance, both projects gradually and iteratively refined networked social learning activities for cohorts of participants to maximize the quality of and quantity of disciplinary interactions among learners (see O'Byrne, Schenke, Willis, & Hickey, 2015). Additional efforts now underway are exploring this question and attempting to derive a more comprehensive characterization of how these perspectives guide the design of successful open badge systems while reconciling the tensions between different perspectives.

Endnotes

(1) Disclosure: the author is participating in this activity as an advisory board member.
(2) Unless indicated otherwise, all of the quotes from are from the submitted proposals or DPD Project interviews which can be accessed at the project website and reported in Author (in preparation).
(3) https://www.pltw.org/pltw-engineering-curriculum
(4) http://asi.ucdavis.edu/programs/safs
(5) http://www.ala.org/yalsa/guidelines/yacompetencies2010

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