EDUCAUSE LEARNING INITIATIVE

BRIEF

Where Badges Work Better

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- **Digital badges are different from conventional credentials because they can contain specific claims, evidence supporting those claims, and links to more claims and evidence; this information can circulate readily in digital networks.**
- **While numerous digital badge systems are functioning in many contexts, badges are still not widely valued by admissions or hiring officials. As such, they are not yet widely valued by many learners.**
- **The most obvious practices for increasing the value of open digital badges (awarding formal credit for them and gaining external endorsements) have proven to be the most difficult practices to enact and formalize. Innovators need to redouble their efforts to do these things while working to exploit other unique features that add value to digital badges.**
- **Stronger connections between digital badges and other relevant innovations such as competency-based education, e-portfolios, credit for prior learning, and stackable credentials seem like promising directions for increasing the perceived value of open badges.**

Following their emergence around 2011, digital badges began transforming the way learning and accomplishment are recognized. Digital badges can contain specific claims and detailed evidence supporting those claims.[1] Those claims and evidence can include hyperlinks to additional supporting information such as student work, rubrics, institutional profiles, course information, and peer or expert endorsement. Perhaps most importantly, *open* digital badges are interoperable in a way that allows them to readily circulate in digital networks. This stands in marked contrast to conventional credentials, which contain remarkably little information and are relatively difficult to share and circulate. As such, open digital badges represent a significant alternative to existing recognition practices. Proponents argue this gives badges massive potential to transform credentialing, learning, and schooling in desirable ways.

Badges are now integral to growing numbers of associations, formal and informal educational institutions, publishers, learning management systems, and entrepreneurs.[2] Projects funded by the National Science Foundation,[3] significant efforts in Europe,[4] numerous badge systems coming online, and widespread media coverage all suggest that open digital badges have become an established feature of the educational landscape in just a few short years.

This explosion of interest in badges was catalyzed by the 2012 Badges for Lifelong Learning competition organized by the Digital Media and Learning (DML) initiative at the John D. and Catherine T. MacArthur Foundation, with additional funding from the Bill & Melinda Gates Foundation. Figure 1 depicts the process by which a subset of the 600+ proposals to the Badge Content and Programs

competition (Stage 1) were partnered with a smaller number of winners of the Badge Design and Tech competition (Stage 2). This paper presents the lessons learned from an extended study of the 29 winning Badge Content and Programs proposals that made it to Stage 3 and were awarded $100,000–200,000 to develop their badge system. The insights come from the Design Principles Documentation (DPD) Project carried out at the Center for Research on Learning and Technology at Indiana University. To provide some context for how these insights might be useful, we first discuss two key current issues associated with badges.

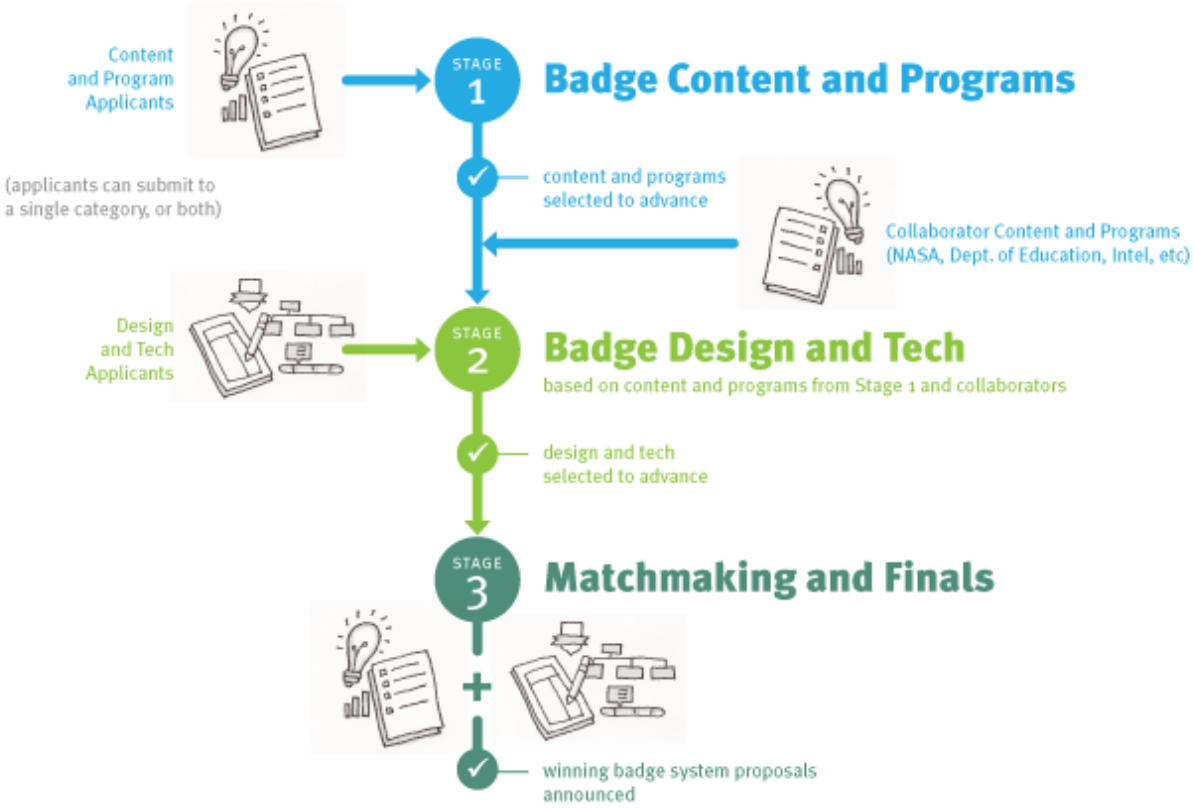

Figure 1. Three-stage competition in the Badges for Lifelong Learning initiative (image courtesy of the Badge Alliance)

The Promise and Problem of Open Digital Badges

As depicted in figure 2, much of the promise of open badges lies in their ability to readily convey a wide variety of learning and accomplishment. This is expected to expand the educational landscape by encouraging innovative new offerings and transforming existing institutions. As illustrated by the nationwide Cities of Learning initiative, badges also promise to help individuals find new opportunities to learn and then follow "digital pathways" in which multiple smaller badges motivate users to "level up" to a more comprehensive badge.[5] Because these comprehensive badges can contain all of the badges in the pathway, they can provide a detailed record of what the learner did. Because viewers of that badge can "click down" to whatever level of detail they wish, such badges promise to be valued on the merits of the evidence contained within the badge rather than on the reputation of the institution that issues it. Relative to conventional credentials, this has obvious implications for educational innovation, equity, and access.

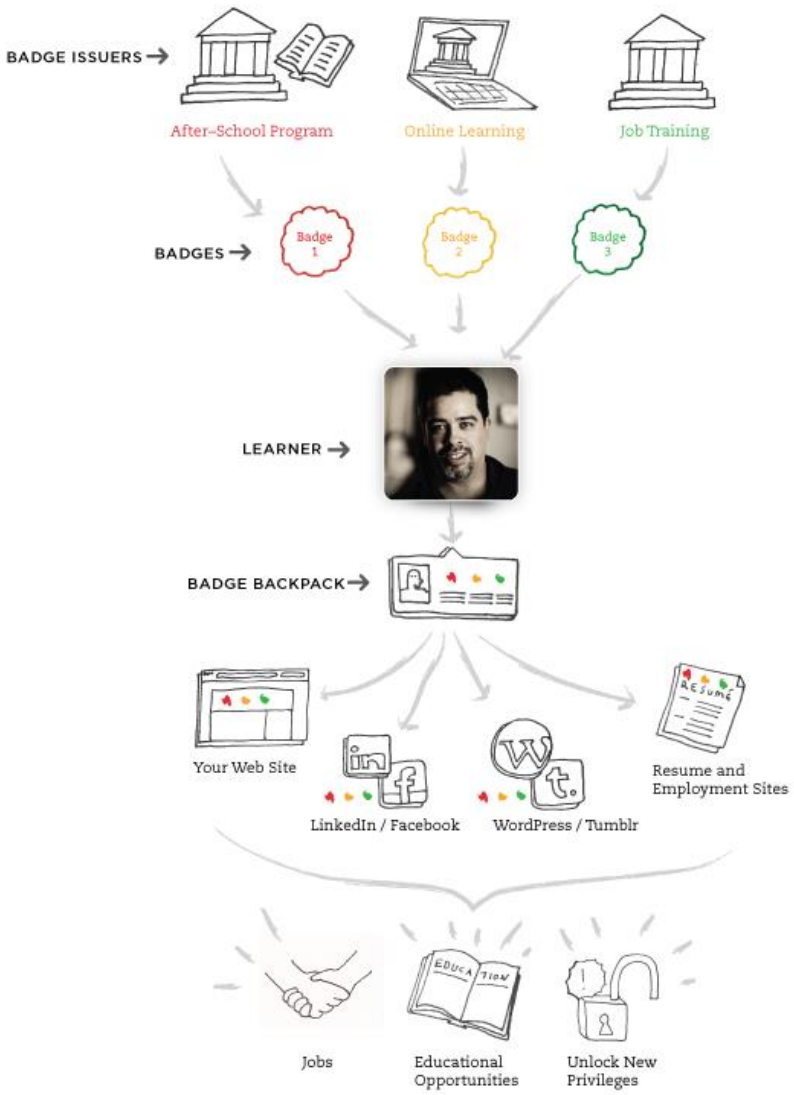

Figure 2. The intended open badges ecosystem (image courtesy of the Badge Alliance)

Other promises associated with digital badges are less obvious. Most schools and universities can only say what their learners *did*, while less formal providers often can't even state that; all educational providers have been hard-pressed to make specific claims and present convincing evidence to support those claims. This lack of specificity and credibility means that most educational programs will experience transformation when they attempt to specify (a) what learning will be recognized, (b) what claims they will make about that learning, and (c) how they will obtain evidence to support those claims. These are generally positive transformations; as touched on below, they can also be quite disruptive. If digital badges do become widely used, these changes and disruptions will occur within entire institutions and eventually entire sectors. Arguably, this will allow educational innovators to transcend existing paradigms regarding credentialing, validity, and motivation that have kept them from exploiting information technology as much as innovators have been able to in other information-based industries.[6]

The major *problem* with digital badges at this time is their perceived value. Even the most ardent proponents admit that digital badges have yet to be widely embraced by colleges or employers. Whereas LinkedIn and other social networks are now widely used for finding and screening applicants (at least in some sectors), open badges have yet to have such impact. Given that the existing

credentialing systems evolved alongside the education and employment sectors over the past century, this should not be entirely surprising. It also should be noted that the open badges pioneers at the Mozilla Foundation were more interested in recognizing less formal sorts of learning that were starting to be offered widely by MOOCs, Peer 2 Peer University, and the many innovators supported by MacArthur's broader DML initiative. Nonetheless, there now appears to be broad support across the open badges community that open badges need to be widely valued by admissions and hiring officials if they are to be widely valued by earners. It makes sense, then, to carefully consider the ways that the 29 pioneering DML efforts to develop open digital badge systems tried to make their badges valuable to the learners who earned them, the colleges and employers who might appreciate them, and peers and other learners who might view them.

The Open Badges Design Principles Documentation Project

The Design Principles Documentation (DPD) Project was carried out from 2012 to 2014. The research was supported by MacArthur's DML initiative and carried out by Indiana University's Center for Research on Learning and Technology. The DPD Project carefully tracked the 29 proposed badge development efforts that were awarded funds in the Badges for Lifelong Learning initiative.

Rather than to "prove that badges work," our intention with this paper is to capture both the goal and the unique context of the project, as evidenced in the title. The project used a very ethnographic stance—it took into consideration the specific contexts, challenges, and advantages of the different programs. In order to provide objective results, the DPD project studied the 29 badge-development efforts without also attempting to support those efforts; hands-on support for the 29 efforts was provided by a team based at the Humanities, Arts, Science, and Technology Collaboratory at Duke University.[7] Additionally, the DPD Project served as a participant (rather than a leader) in the efforts of the Mozilla Foundation to create the standards and applications that became the Open Badges Infrastructure (OBI) and to foster the larger open badges community beyond the 29 funded efforts.

After extended consideration and discussion, the DPD Project was organized around four observed *functions* of digital badges.[8] This focus on functions (rather than intended *purposes*) highlighted the DPD Project's goal of capturing both the intended and unintended consequences of introducing digital badges into existing learning ecosystems or attempting to build new ecosystems around badges. The four badge functions that the DPD Project studied were:

- *Recognizing learning* (credentialing the skills, achievements, experiences, and practices within individual, peer, and social groups)
- *Assessing learning* (the summative, formative, and transformative practices used to gather evidence that is employed to recognize learning)
- *Motivating learning* (the intended and unintended intrinsic, extrinsic, and social incentives for learning)
- *Studying learning* (including summative research of badge systems and formative research to improve those systems, such as research using the wealth of evidence contained in badges)

The DPD Project documented how these functions unfolded across three stages in each of the 29 efforts:

- *Intended practices* (the badging practices specified or implied in the original proposal, derived from content analysis of the proposal text)
- *Enacted practices* (how those intended badging practices unfolded in the world, derived from structured interviews with project teams once the badge development was under way)
- *Formalized practices* (the badging practices that endured after the badge-specific funding was exhausted, derived from structured interviews and extended follow-up communication)

Once the intended and enacted badge design practices were uncovered in each of the 29 projects, the practices in each of the four areas were clustered into smaller numbers of more general badge design principles. These principles were previously published in an interim report in November 2013.[9] Throughout 2014, the DPD Project studied which practices were formalized in each effort and attempted to uncover the factors inside and outside the badge development efforts that supported some practices while impeding others. At the end of 2014, the DPD Project determined (a) whether each of 29 badge systems was *implemented*, *suspended*, or *paused* and (b) whether that badge system was *similar to* or *different from* the proposed badge system. At that time, the DPD Project also attempted to determine whether each of the 29 projects had succeeded in creating a broader badge-oriented learning "ecosystem" and whether that ecosystem was similar to or different from the one envisioned in the original proposal.[10]

Needless to say, the DPD Project gathered a massive amount of information about each of the projects and the four sets of design principles. All of the findings summarized here are currently available at the project website.[11] The team is currently finalizing the data, reviewing the relevant research literature, and writing additional vignettes for a comprehensive report to be published shortly. It should be emphasized that it is quite challenging to objectify and quantify this sort of messy, contextual data across numerous projects that continued to evolve. As such, these findings are tentative and are intended to be more illustrative than conclusive.

Six General Conclusions from the DPD Project

Looking across the 29 DML badge development efforts and across the four sets of DPD badge design principles yielded six general conclusions that we hope others will find useful when attempting to design systems for creating open digital badges that are widely valued. These conclusions are illustrated with examples from the seven DML efforts that designed badges for adult and/or postsecondary learners and/or employed practices that would be also be relevant for those contexts.

Conclusion 1: Badges work better in some places than others.

As shown in the left half of figure 3, we concluded that by the end of 2014, 16 of the badge development efforts succeeded in creating the badge system outlined in the original proposal, 8 of the efforts created a substantially different badge system, and 5 did not succeed in creating a badge system. As shown in the right side of figure 3, 11 of the efforts succeeded in creating the broader badge-based learning ecosystem envisioned in the proposal, 11 succeeded in creating a significantly different ecosystem from the one envisioned in the proposal, and 7 did not succeed in creating an ecosystem.

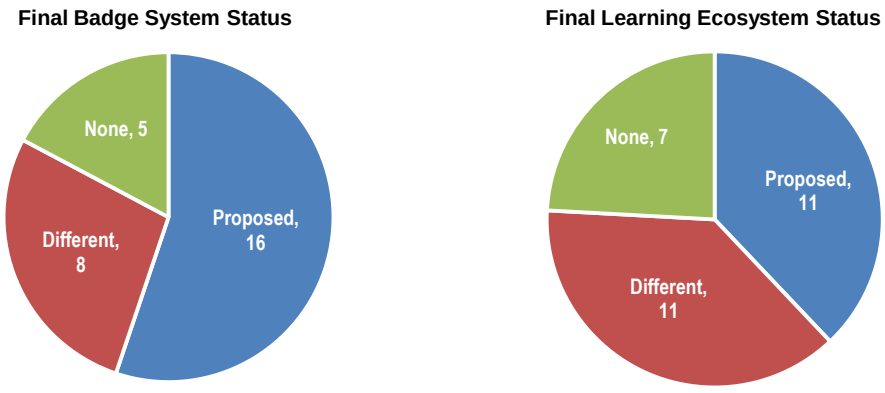

Figure 3. Final badge system and ecosystem status

For example, the Badges for Vets effort succeeded in building its proposed badge system for helping veterans translate their skills into digital badges.[12] However, factors including lack of cooperation from other organizations and agencies prevented the larger badging ecosystem from emerging around the new website and badge system (figure 4). Instead, a networking ecosystem emerged around the project that ultimately was very different from the one envisioned in the proposal and in which badges played a minimal role.

Figure 4. Badges for Vets website and badge system (image courtesy of Eric Burg)

Alternatively, the Sustainable Agriculture and Food Systems (SA&FS) degree program at the University of California, Davis, succeeded in creating a widely touted badge-based e-portfolio system (figure 5) as part of a new degree program. While many of the insights that went into the design of the badge system were used to shape the new degree program, insufficient institutional support and staff turnover kept their ambitious badging system from being implemented programmatically. While the new degree program was indeed established, the badges system itself was suspended.[13]

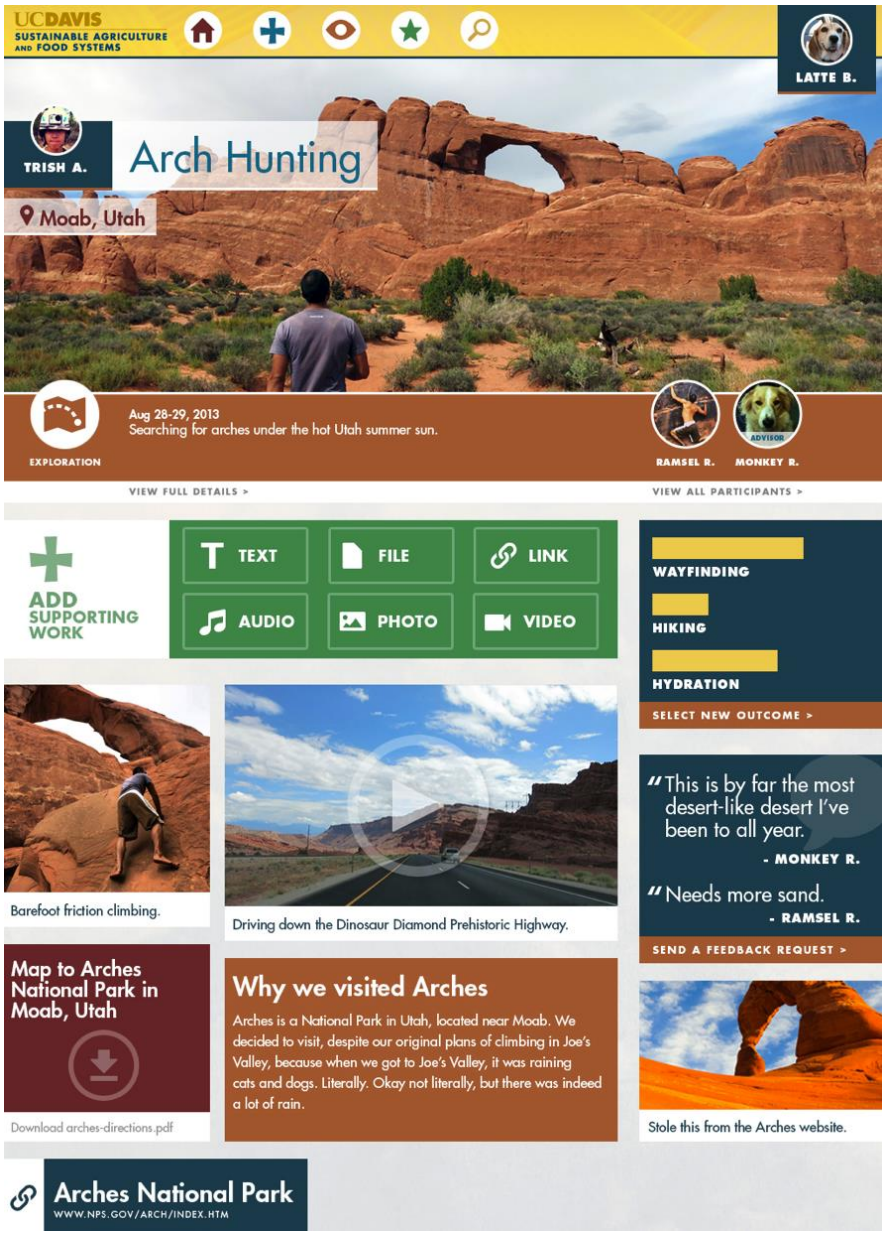

Figure 5. E-portfolio badges at the Sustainable Agriculture and Food Systems Program (image courtesy of Joanna Normoyle)

Conclusion 2: Badges work better where content and technology already exist.

In our search for factors in badge system success, the DPD Project coded the 29 DML efforts according to the five starting configurations (existing educational content and/or existing educational network technologies) identified by Sheryl Grant at HASTAC.[14] As shown in figure 6, the nine "responsive" projects that started with content and then built badges and technology were generally most successful. For example, the Young Adult Library Services Association (YALSA) successfully built its responsive badge system for competencies in serving youth in libraries from existing educational content and by building both the website and the badges for learning that content.[15] Highlighting both the advantages and challenges of building both the educational website and the badge system, YALSA was forced to scrap its first Drupal-based platform because it could not support some key features associated with the badges and content. While this led YALSA to scale back some of its intended educational practices and badge functions, it still managed to create both the badge system and learning ecosystem that resembled the one originally proposed.

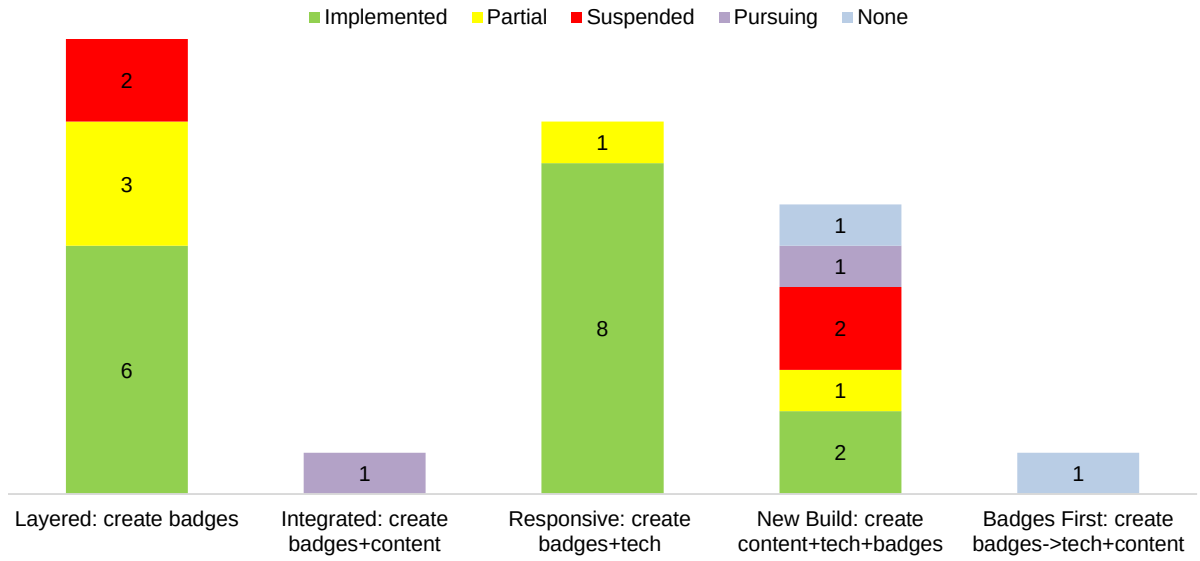

Figure 6. Badge system implementation status by starting configuration

The next most successful starting configurations were the efforts that "layered" badges into existing educational content and learning technologies. The Microsoft Partners in Learning Network effort succeeded in layering technology competency badges for K–12 teachers and administrators into its existing educational content and website.[16] Highlighting a potential downside of the layered approach, constraints with Microsoft's existing technology led to a very different badge system from the one proposed: The existing website was apparently incompatible with the OBI-compliant "open" badges. This means that the Partners badges reside only inside the website and can't be readily shared.

As shown in figure 6, the other three starting configurations generally resulted in less successful badge system development efforts. Only two of these nine projects succeeded in building a badge system: The Smithsonian Museum succeeded in building the content, technology, and badges for its Nature Badges system, while the startup BuzzMath succeeded in building the content, technology, and badges for its math tutorial system. It is worth noting, though, that DML funding for these two efforts represented only a fraction of a much larger investment in these new learning ecosystems. This stands in contrast to the SA&FS "new build" effort at UC Davis that attempted to create badges, content, and technology primarily with the DML funding (leading to a *suspended* badge system).

In summary, the more work that each badge development effort had to create, the less likely it was to create and implement the badge system. Needless to say, this makes sense. But buried in some of the details of each project lay some cautionary tales about how such efforts might go awry. We have presented just a few of those factors here; we are currently compiling the larger set in the final report covering all 29 projects.

Conclusion 3: Badges work better as informal credentials.

This conclusion gets at the heart of the tension introduced above. To reiterate, there is a broad consensus that digital badges are not widely valued by employers or colleges and therefore are not widely valued by earners. As such, the DPD Project paid particular attention to the badge design principles that aimed to increase the value of badges. Generally speaking, they struggled to do so. For example, 5 of the 29 efforts proposed to award formal academic credit for badges.[17] Of those efforts, four of them (including SA&FS) were unable to formalize the practice. Like SA&FS, the Level Up effort at Adams County School District 50 in Colorado was part of a larger transformation toward a

competency-based system. The Level Up badges, along with most other elements of the new system, were abandoned when funding for the larger system dried up and parental opposition mounted. The Youth Digital Filmmaker badges in Philadelphia schools never made it beyond the pilot stage after struggling with district policies, technology integration, and overly ambitious assessments. 3D GameLab intended to award formal transfer credit from an affiliated university for its NOAA Planet Stewards badges for secondary STEM learning. Planet Stewards was one of the more successful efforts in terms of the intended badge system and ecosystem; the transfer credit was one of just a few elements of its proposal that 3D GameLab was unable to formalize within the grant period.[18]

The one badge development effort that succeeded in awarding formal credit was the Providence After School Alliance (PASA). However, PASA was only able to formalize this principle because it had already spent several years implementing sophisticated program quality standards, an attendance tracking system, and a portfolio assessment and review system. Nonetheless, it subsequently suspended the badges program after an intensive ethnographic study of the program confirmed suspicions that students did not value the badges.[19] The PASA leaders concluded that all of the energy that went into validating the badges for formal credit did not help make those badges valuable to the earners.

Conclusion 4: Badges work better when internally valued.

Another obvious design principle for increasing the value of badges is to seek external endorsement. Of the 10 badge development efforts that proposed to seek formal external endorsements, however, only 4 were able to formalize the principle during the project period. For example, although 3D GameLab was unable to gain formal credit for its badges, it did obtain formal permission to use the name (but not the logo) of the National Oceanic and Atmospheric Administration (figure 7). This was made possible in part because NOAA researchers had provided the data sets used in the activities and NOAA instructional designers had carefully reviewed the curriculum and assessments for accuracy and validity; their observations were then shared with NOAA administrators. Nonetheless, NOAA, like most such agencies, was even more restrictive regarding their logo, and did not allow its use on the 3D GameLab badges.

Figure 7. NOAA Planet Stewards leveled badges in freshwater "careers" (image courtesy of 3D GameLabs)

The six projects that failed to gain external endorsements cited a range of obstacles. For example, the Who Built America? badges for history teachers were successfully developed by the Education Development Center and the American Social History Project. The group attempted to gain external endorsements for its badges from the National Council for the Social Studies, National History Education Clearinghouse, and the Stanford History Education Group. DPD Project interviews found that one of the issues was that these external organizations did not really understand the concept of badges.

The National Manufacturing Badge System developed by the Manufacturing Institute ran into a more explicit challenge that nicely captures the current tensions for digital badges. Although the group succeeded in building the proposed badge system, the larger ecosystem never emerged. This was in large part because the effort failed to secure external endorsement from employers. More specifically, employers were unwilling to commit in advance to hiring individuals who might earn the badges. Without these endorsements and commitments, interest in the badges among potential earners and issuers quickly withered.

Conclusion 5. Badges work better when they offer unique claims and evidence.

One of the insights that emerged near the end of the DPD Project concerned the uniqueness of the information contained in the badges in each system. While this was not a principle that the project studied systematically, it seems that the efforts that developed badges whose claims and evidence were redundant with other information sources struggled to establish the value of those badges. For example, 4-H/USDA Robotics Badges was a collaboration between the USDA-funded youth development program (4-H), Auburn University, and the University of Nebraska–Lincoln. The effort struggled with technical issues, and the badge system was only partially implemented. One of the issues that the project directors raised was that the support for the project waned when issuers and earners realized that the evidence and claims contained in the badges were redundant with the 4-H organization's existing recognition system (ribbons and trophies). The DPD Project concluded that by extension, this also meant that any learning ecosystem that might have emerged would also have been redundant with 4-H's existing social network around after-school clubs and county fairs.

While this finding was not as definitive as some of the others from the DPD Project, it seems worth considering in light of the tensions described above. This certainly seems related to the observations regarding efforts to associate badges with formal credit. As 4-H and many other badge development efforts found, numerous hurdles must be overcome to create successful digital badge ecosystems. If those systems simply communicate information that is presented in some other formal credential system, the value of the badges is diminished. It is also unlikely that the larger learning ecosystem around those badges will emerge.

Conclusion 6. Badges work better where the learning is social and networked.

An obvious question for the DPD Project concerned the characteristics of the 11 efforts that succeeded in creating the badge-oriented ecosystems envisioned in the original proposals. We were particularly intrigued by two of the projects whose ecosystems appeared to be most robust. The Supporter to Reporter Medals (S2R) effort layered badges into the existing content and technology of a youth sports journalism network developed by DigitalMe in the United Kingdom. The badge design practices that DigitalMe successfully formalized included the following five: use badges as a means to externally communicate learning; use e-portfolios that are open to the public; use e-portfolios to foster discussion around artifacts; use rubrics; and promote social learning. The effort resulted in a robust portfolio assessment system that successfully formalized the assessment principle "use a combination of human and computer experts to award badges" around a manageable mix of computer-awarded and expert-awarded badges. Specifically, the more routine bronze-level badges were awarded automatically when students posted their initial artifacts; the more prestigious (and scarce) gold-level badges were awarded by experts (teachers).

The success of the S2R badge system is particularly noteworthy in light of the practices for enhancing the value of its badges that it was unable to enact. S2R was one of the six efforts that was unable to gain external endorsements (including the BBC and leading national football/soccer clubs) or to provide incentives by offering internships. The project responded by redoubling its efforts to formalize other

practices to increase the value of the badges (e.g., use leveled badge systems, align assessments to standards, promote social learning, provide incentives by offering peer mentorship, keep badges scarce, and foster professional identities) and to introduce new practices that were not included in the original proposal (e.g., promote discovery and offer badges to participating educators).

The second highly successful badge ecosystem was the one created around MOUSE Wins! badges for technology and network management skills. The MOUSE youth-development organization created these badges to recognize the learning of young volunteers assisting the network administrators and tech support staff in their own high schools. The DML award allowed MOUSE to layer badges into the existing content and technology of its nationwide online education and mentoring support network. As elaborated in the DPD Project website,[20] MOUSE created valued badges by successfully formalizing key practices for recognizing learning (e.g., use badges to map learning trajectories, have expert peers issue badges, and recognize diverse learning) and assessing learning (promote social learning, use performance assessments, and use leveled badge systems). The DPD Project concluded that by formalizing these practices, MOUSE also succeeded in formalizing crucial motivational practices (display badges to the public, engage with the community, and recognize identities).[21]

What is distinctive about these two highly successful projects is that they both layered badges into existing content and technology that was inherently social in nature. Both projects targeted disciplinary knowledge that was inherently social; this is obviously the case with journalism at S2R. But MOUSE's digital networks are also social tools, and much of the expertise needed to keep them running is formed and accessed on professional digital knowledge networks. In addition to focusing on social learning, both projects formalized the assessment of social learning as a badge design practice. Such assessment practices generate evidence of participation that badges are uniquely qualified to present; that evidence also confounds conventional credential systems. In this way, these two badge system development contexts were perhaps the most consistent with the broader DML initiative that provided much of the impetus behind open digital badges.

The Current and Future Status of Open Digital Badges

The DPD Project found that the most obvious practices for increasing the value of open digital badges (academic credit and external endorsements) turned out to be the most difficult to enact and formalize. This finding seems to highlight a central challenge facing any effort to develop an alternative to existing learning-recognition and credentialing systems. The existing systems evolved gradually as the various practices for credentialing, admitting, and hiring reciprocally defined each other. This coevolution likely stretched over decades and probably went unnoticed by most stakeholders. Along the way, multiple networks and numerous relationships developed that ultimately define the credentialing ecosystem. Many of the networks are tacit and built on personal and professional relationship that naturally emerge in such contexts. As such, some of these networks and relationships likely ignore or even contradict official policies and broadly assumed practices. By definition, alternative credentialing systems must contend with those existing practices. Doing so is likely to be difficult, particularly if organized around a specific innovation (such as badges), over short periods of time (like these projects), and/or by innovators with partial knowledge of the existing systems for admissions and hiring.

We are unsure of the practical implication of this finding for individual badge development efforts or, for that matter, the larger open badges community. On one hand, it might make sense for individual projects and the community to redouble efforts to award formal credit and gain external validation. On the other hand, it might make more sense to follow the lead of the two most successful projects and (a) pursue other venues for increasing the value of badges, (b) focus badging efforts on the more social forms of knowing and learning, and (c) ensure that badges contain unique, nonredundant information. Of course, digital networks are coming to define knowing and learning in many disciplines and

contexts. This makes it easier to create and access learner-generated artifacts and other evidence of participation and learning that confounds conventional credentialing systems. Perhaps the most promising avenue is associating digital badges with formal credit and external recognition, while also ensuring that those badges contain multiple levels of detailed additional claims and evidence. In this way, the information in the badges gives additional meaning and value to the formal credential.

Some early entrepreneurs have already stepped out and several new ones have emerged. As more and more learning moves online, learning management systems (LMSs) are playing an increasingly central role in all aspects of education and, by extension, badges. As institutions abandon homegrown and early LMSs (e.g., Sakai and My Big Campus), they are struggling to get the existing content and credentials out of those systems. A recent ELI paper suggests that the near future of the LMS will take a "Lego approach" with interoperability and integration; personalization; analytics, advising, and learning assessment; collaboration; and accessibility and universal design.[22] Thanks to new Learning Tools Interoperability (LTI) standards, it is increasingly possible to seamlessly transfer content and credentials across LMSs and for that information to reside outside any particular LMS. Parallel developments are occurring with digital badges. The early concern that badges be shareable across platforms has been extended to the goal of full interoperability across all current platforms and extensibility to any future platforms. The original JavaScript Object Notation (JSON) specifications are being replaced by JSON-LD (linked data) specifications. The envisioned open-source systems for issuing, hosting, and verifying badges from Mozilla are being supplanted by a constellation of extensible external applications and tools. Two of the specific developments in this regard currently under way in a subsequent project include the release of an open-source xBlock for badges in the Open edX platform[23] and the release of open-source third-party external badging applications that are LTI-compliant and can be used with Canvas, Blackboard, and CourseBuilder.[24]

In addition to compliance with standards, another significant development is an emerging consensus among leaders in the open badges community that stronger ties are needed with other related movements such as competency-based education, credit for prior learning, and "stackable" digital credentials. Several recent developments show significant progress on these fronts. Particularly notable is the recent embrace of the Mozilla open badges standards and leadership team by IMS Global Learning Consortium as part of a new initiative to "establish digital badges as common currency for K-20 and corporate education."[25] This shows progress toward widely accepted international standards for digital credentials like those established by the World Wide Web Consortium (W3C) that have made web payments secure, ubiquitous, and compatible with mobile devices.

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Notes

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7. See Digital Badges at HASTAC.
8. Daniel Hickey, “Intended Purposes Versus Actual Function of Digital Badges,” HASTAC blogs, September 11, 2012.
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10. Illustrating the subjective nature of this evidence, there was sufficient uncertainty for some of the projects that this status was determined by a blind vote by all of the DPD Project team members.
11. See the Design Principle Documentation Project.
12. See Badges for Vets.
13. See the Sustainable Agriculture and Food Systems Major at the University of California, Davis.
14. Sheryl Grant, “5 Buckets for Badge System Design: ‘You Are Here’,” HASTAC blogs, October 23, 2013.
15. See Badges for Learning, Young Adult Library Services Association.
16. See Earn Badges, Microsoft Educator Network.
17. Six of the 29 proposals indicated a more specific practice that was ultimately categorized as an example of the more general principle.
18. While some teachers implemented the Planet Stewards badges in graded lessons, the badges themselves were not used as formal credentials for grades.
19. Katie Davis and Simrat Singh, “Digital Badges in Afterschool Learning: Documenting the Perspectives and Experiences of Students and Educators,” *Computers & Education* 88 (2015): 72–83.
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