

### **Abstract**

Digital badges provide new affordances for online educational activities and experiences. When used with points and leaderboards, a badge can become a gamification element allowing learners to compete with themselves or others, and to know how close they are to accomplishing a goal and acquiring its accompanying reputation. In this role, badges motivate continued engagement, which increases time on task and supports skill acquisition through performance. Learning outcomes signified by badges can also be displayed in an e-portfolio or on web sites and are highly transportable to social media sites. In this role they summarize achievement and signal accomplishment. With these characteristics, digital badges have the potential to become an alternative credentialing system, providing visible recognition in digital symbols that link directly via metadata to validating evidence of educational achievements in public displays. This paper will trace the brief history of digital badges, define what they are, give examples of their use, and discuss their educational affordances.

## Introduction

A search of the term “digital badges” on Google Trends shows that the worldwide interest in the term only dates from 2010 (Figure 1), so it may be too early for a comprehensive literature review of digital badges in education. The Badges for Lifelong Learning Competition and Mozilla’s Open Badges initiative, which has stimulated much of that global conversation, only officially launched on September 15, 2011, with the participation of the U.S. Secretary of Education (Duncan, 2011; Surman, 2011). Yet interest has quickly grown. While the production version of the Open Badges “application-programming interface” (API) appeared on March 14th, 2013, at publication date of this entry there are more than 700 unique registered issuers linked to over 75,000 digital badges.

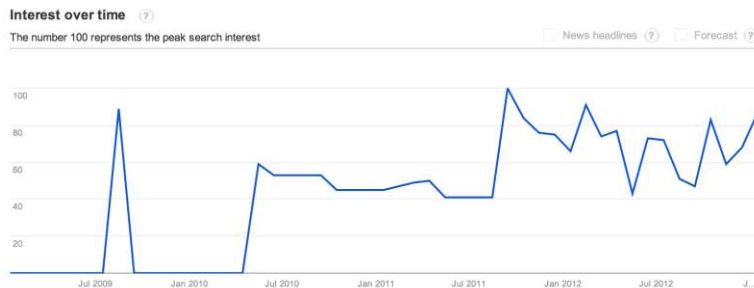


Figure 1. Worldwide Google searches using the term “digital badges” from January 2009 to January 2013. (Author created graphic using Google Trends).

A search of peer-reviewed educational journals reveals evidence of the lag in time from research and development to publication. For example, the terms “badge” and “digital badge” only returns a handful of formal publications in education and game

studies. However, the number of projects funded by foundations and the rapid increase in informal communications on the over 500 blog posts at [digitalbadges.hastac.org](http://digitalbadges.hastac.org), and several dozen other websites of funded projects, are evidence of the momentum and energy in the global conversation.

In this article we provide first-hand information about digital badges by going directly to and engaging with people and sources involved in creating the emerging open badge infrastructure (Mozilla, 2013) ecosystem, and then consider the implications for education. This article thus relies heavily on field notes and direct communications via emails and blog postings from founders, creators and early adopters.

### **Definition and Uses of Digital Badges**

A digital badge is a representation of an accomplishment, interest or affiliation that is visual, available online, and contains metadata including links that help explain the context, meaning, process and result of an activity. One kind of process, for example, might be the peer and expert review of artifacts of work showing what someone knows and can do, and the accompanying validation and credentialing of that person's knowledge or capability. The practice of creating, awarding and displaying digital badges has emerged from the intersection of digital games practices, online reputation systems used in commerce (e.g. eBay, Wikipedia and Amazon) and media culture as well as the historical custom of awarding recognition via physical status icons, such as ribbons, medals and trophies.

Achieving or receiving a digital badge can occur in a variety of ways ranging, for example, from the results of free-choices on web sites, participating in online engagements, reaching performance benchmarks, and responding to informal and formal

assessments. Displaying badges on a personal webpage, electronic portfolio or a social website is a way to establish and share a part of one's identity and reputation – particularly what one knows and is able to do.

Digital badging increasingly appears in promotion and engagement strategies to encourage desired online behaviors. For example in 2005, Microsoft introduced one of the first examples of an achievement system with the Xbox 360 Gamerscore, which had the effect of integrating individual games into an ecosystem and led to new community practices based on individual roles and responses to the system of recognition (Jakobsson, 2011). As another example, badges at the social media site Foursquare.com encourage users to check-in frequently, to utilize the social network often and to accumulate credit, recognition and prestige. These uses of badges not only motivate desired behaviors and provide status and recognition in an online community, but also foster brand loyalty and customer retention, features that have not been lost on education futurists and those involved in the transformation of teaching and learning (Davidson & Goldberg, 2009).

In education in particular, badges and badging systems are emerging to

- Incentivize learners to engage in positive learning behaviors
- Identify progress in learning and content trajectories
- Signify and credential engagement, learning and achievement

In order for badges to be recognized as meaningful indicators of learning, as would any symbol of a valid educational assessment, they must be linked with evidence of activities, experiences and artifacts created during a learning engagement (Gibson,

2006a; Mayrath, Clarke-Midura, & Robinson, 2011). The association with such evidence can be as simple as a hyperlink to a description, or in more sophisticated applications, the image or multimedia file displaying the badge is encoded with metadata; for example using the affordances of the “.png” functionality (ISO/IEC, 2004). To support meaningful use of digital badges in education, developers of digital badging systems embed metadata concerning relationships such as:

- Issuer
- Standards achieved and certified
- Activities undertaken, artifacts created, and situations experienced
- Quality of the experiences, products and performances

Badges showing these connections can serve to communicate and translate learning across the peer, interest and learning contexts of one’s life.

As might be obvious, the strength and utility of an educational badging system is closely related to the learning engagement and assessment strategies of the issuing organization and relies on a combination of factors including the credibility of the organization and the recognition and acceptance of the badge by other users. This trust is conveyed if the badge is a valid and reliable symbol of learning certified by an issuer and both the issuer and the badge award process are accepted within an ecosystem of other people and institutions.

### **Origins of Badges**

According to the Oxford English Dictionary, badges were a heraldic symbol worn by knights, which were later worn as jewelry, or to denote the completion of a pilgrimage or as a mark of political allegiance (OED, 2013). In rites and rituals the badge has long

been associated with displays of rank and achievement, and more recently has been associated with advertising, branding and visual identification of membership (Halavais, 2011).

Digital badges seem to be a metaphorical and more flexible extension of recognition practices such as the merit badges used by the Boy Scouts association around the globe (Hintz, 2009). The merit badges highlight the achievement of the scout in terms of a clearly defined skill or knowledge set demonstrated at an established standard or level of practice, a model that suits the educational context especially well.

With the advent of the Internet, some of the first digital badges may have been website traffic counters that displayed the popularity of a page, badges were also developed to link users to associated sites in “rings” of sites operating as communities (e.g. [webproject.org](http://webproject.org) still displays the PBL Web ring badge). Electronic payment services are often noted with a badge testifying to their security, and badges linking to social media help users share with friends and show others one’s preferences, “likes” and status. For example, in Wikipedia Barnstars, badges are a type of award recognizing the activities of Wikipedia editors. (McDonald, D., Javanmardi, S., & Zachry, 2011).

Using digital badges in education has also emerged in relation to a larger conversation about testing and credentialing. Eva Baker, for example, in her presidential address to the American Educational Research Association, discussed both the end and the ends of testing (E. L. Baker, 2007) and suggested that alternative forms of recognition of learning were both needed and on the rise. Other scholars have examined the role of credentials, the robust transformation that has been occurring due to massive open online

learning, and the impacts of these trends on research into the sociological dimensions of formal education (D. P. Baker, 2011; Gibson, 2012).

### **Badge Ecosystem Infrastructure**

To date the most comprehensive development of a badging environment is arguably found in the Mozilla Open Badges Infrastructure which publishes an interoperable standard (Mozilla, n.d.). Other systems are emerging with similar goals and approaches (e.g. Credly (<https://credly.com/>) and Badgestack (<http://demo.badgestack.net/>). The Mozilla OBI is built upon open software strategies and is intended to provide a structured and standardized environment to utilize the characteristics of digital badges to recognize both formal and informal learning. The OBI provides a platform for verification, portability, creation and collection of digital badges, with associated metadata needed for their acceptance as useful credentials.

Metadata is a relatively simple but important concept needed to understand the educational affordances of digital badges. The term refers to “data about data” and in this current context, we’re referring to descriptive markers placed in a stream of data, which informs a machine about the contents. For example in the string “<bank> <deposit> \$1000” there is a subject-predicate-value triple (also called a class-attribute-value triple) which informs a computer to put \$1000 into a bank. The computer knows this because the controlled vocabulary of the internationally computerized banking system has agreed to the definitions of the words “bank,” “deposit” and the number system for currency, as well as what to do with some value when it is called a deposit (e.g. put it in, do not take it out).

This seemingly straightforward process if implemented in an educational context has the potential to transform teaching and learning in a way similar to that of the other industries that have adopted machine-to-machine business processes. For example, areas that could be dramatically impacted include transfers of academic credit, responsive learning system that can find resources based on a learner's actions and interests, automated scoring of student work, and finding and organizing study teams, problem-solving groups, and courses, units and classes.

Other more proprietary badging systems may accommodate varying degrees of interoperability, but both the private and open source developers seem to be aware of the need for portability of credentials and the expectations that users will want to accumulate and display badges. Thus custom solutions are emerging as stand-alone products (e.g. Accredible (<https://www.accreditable.com/>) and as products that leverage open application programming interfaces (APIs); for example, Purdue Passport (<http://www.itap.purdue.edu/studio/passport/>), Blackboard Open Badges Building Block (<http://projects.oscelot.org/gf/project/openbadges/>), and Wordpress Plugins (<http://wordpress.org/plugins/simple-badges/>). Mozilla is also experimenting with an open source badge-issuing platform called Open Badger and a personal e-portfolio called the Backpack.

Digital badges in education are thus rapidly evolving as objects of use in teaching and learning. Systems incorporating badges often add many features to create hybrid tools that serve purposes such as a scoreboard of activity, a formal record of accomplishment, and a portfolio of evidence of learning.



### **Educational Affordances of Digital Badges**

The affordances of digital badges for education can be categorized into four key areas: motivation, recognition and credentialing, evidence of achievement, and research on the linkages among and impacts of the affordances. The first three directly concern teaching and learning and the fourth concerns educational research.

#### **Motivation**

Acquiring digital badges motivates some learners to continuously engage with online materials and activities that have been designed to help them achieve intended learning outcomes. The activity of acquiring badges can thus drive the acquisition of knowledge and skills (Abramovich, S., Schunn, C., & Higashi, 2013). A series of badges, acting like signposts for potential achievements, can also provide users with information about further learning opportunities, forming a kind of pathway model for achievement and making that pathway more transparent and accessible for the learner. Each badge with its metadata, for example, can point to the next steps for progress and the requirements for success. This motivational affordance implies that as open educational badge ecosystems evolve, digital badges will begin to appear in applications as diverse as recruitment (e.g. [americasarmy.com](http://americasarmy.com) and [stackoverflow.com](http://stackoverflow.com)), online learning programs that help learners meet the requirements for college entrance, skill-building applications that provide pre-professional practice (e.g. [simschool.org](http://simschool.org)), serious games that promote health and wellness (e.g. [gamesforhealth.org](http://gamesforhealth.org)), informal out-of-school learning (e.g. [roadtripnation.com](http://roadtripnation.com)), self help and emergent study group programs ([openstudy.com](http://openstudy.com)), test preparation applications (e.g. [grockit.com](http://grockit.com)), game-based learning

management systems ([3dgamefab.com](http://3dgamefab.com)), and human resource training programs in leadership and other fields (e.g. [www.simulearn.net](http://www.simulearn.net)).

### **Status Recognition**

A second affordance of digital badges is to provide recognition of status, which is naturally and closely connected with validation and accreditation. In the game world, collecting badges often permits new task accomplishments and levels of achievement along the game's storyline. So possession of a badge is a credential. Digital badges in education can similarly provide a direct link to an assessable artifact, or an indirect link to a collection of evidence needed to pass a unit, graduate from a program, or get a job.

Due to the direct linkages to the evidence of learning and achievement, there is considerable flexibility concerning the skills that can be recognized and legitimized via digital badges. For example, higher order skills such as collaboration and entrepreneurial thinking, 21<sup>st</sup> Century skills, and social skills, which are not normally recognized in university degrees and professional credentials, could be supported by a badge that points to a video of those skills in action. A digital badge can thus represent a new type of measure and method to display both achievements and status, as it is digitally linked to further representations of the skill, knowledge, or activity that it signifies. In education, digital badges can thus be used to provide both direct and indirect evidence of knowledge, knowledge-in-use, skill mastery and levels of attainment.

Digital badges can also assist users in building and formalizing identity in social media networks. Linked with user profiles, digital badging allows for the development of formalizing reputation within and across communities. A network profile page that displays digital badges may support community and kinship by helping others discover

shared interests and skills. Sharing interests, identity and reputation enhance the personal side of status recognition; for example an expert badge from a knitting community (e.g. [ravelry.com](http://ravelry.com)) signals the status of a person who might be able to help you learn how to knit and someone you might like to get to know.

### **Evidence of Achievement**

A third affordance of digital badges comes via their direct link to digital artifacts that provide evidence of knowledge, knowledge-in-action, capabilities and achievement. Digital badges with appropriate metadata can be a transparent mechanism for showcasing authentic artifacts of the activity they represent. In addition, the means of valuing those artifacts can themselves be made more transparent via the badge's metadata. For example, e-portfolios that display rankings and valuations as part of badges allow a variety of audiences (e.g. self, trusted others, and the public) to see, reflect on and review differentiations and make quality judgments about artifacts created during learning engagements (Gibson, 2006b). Accredible ([accreditable.com](http://accreditable.com)) is an example of an online resume where a ranking system attached to a badge allows viewers to assess its value.

The evidential affordances of digital badges for assessment and verification of learning is of considerable value for education. Digital badges provide ways for learners to capture and display their learning pathway and allow for granular representations of skills and achievements. Badges also provide a way to signal skills and achievements to relevant stakeholders such as employers, institutions or connected social networks. In sum, digital badging can provide an effective, transparent, and often user-centric manner in which to display evidence of learning while directly linking to information that is needed to understand, authenticate and validate the badge and the learning that it claims

to represent.

### **Research Implications**

Digital badges provide several new affordances for education that need additional research. How do badges impact intrinsic motivation via gamification of educational activities and experiences? Points, badges, and leaderboards are noted gamification elements that are making their way into educational practice. For example, learners can compete with others, or with a self-imposed goal to attain more knowledge and the accompanying reputation of a series of badges while they learn. Digital badges can be part of score keeping for educational journeys. But will they replace intrinsic motivation to learn, and would that be a bad thing if they did?

Badges from learning experiences anywhere, anytime can form part of an e-portfolio. How will formal systems of education adapt if companies begin hiring people on the basis of their Linked-In badge collection rather than their degrees? How will admissions offices deal with a pre-collegiate record of achievement represented in badges? If a global badge ecosystem becomes an alternative credentialing system, how will higher education respond?

These questions concerning the impact of digital badges in education on the psychology of learning and the processes and organization of education require further research. The IFIP working group 3.3 has been discussing IT and assessment for several years and is helping researchers around the world to become aware of the potential and challenges now emerging.

### **Conclusion**

This paper traced the brief history of digital badges, defined what they are, gave examples of their use and links to some of the important digital badge projects now underway, and discussed in broad terms their educational affordances. Because digital badges seem to have important impacts on motivation for learning, status within a community, and can transparently display achievement level, validation processes and directly link to rich media evidence, the research implications are quite broad and varied. The potential seems high for a transformative moment in the history of technology in teaching and learning.

## References

- Abramovich, S., Schunn, C., & Higashi, R. (2013). Are badges useful in education?: It depends upon the type of badge and expertise of learner. *Educational Technology Research and Development, 61*(2), 217–232. doi:10.1007/s11423-013-9289-2
- Baker, D. P. (2011). Forward and backward, horizontal and vertical: Transformation of occupational credentialing in the schooled society. *Research in Social Stratification and Mobility, 29*2-29.
- Baker, E. L. (2007). 2007 Presidential Address The End(s) of Testing. *Educational Researcher, 36*(6), 309–317. doi:10.3102/0013189X07307970
- Davidson, C., & Goldberg, D. (2009). *The Future of Learning Institutions in a Digital Age*. Chicago, IL: John D. and Catherine T. MacArthur Foundation.
- Duncan, A. (2011). Digital badges for learning: Remarks by Secretary Duncan at 4th annual launch of the MacArthur Foundation Digital Media and Lifelong Learning Competition. Washington D.C.: U.S. Department of Education. Retrieved from <http://www.ed.gov/news/speeches/digital-badges-learning>
- Gibson, D. (2006a). Elements of Network-Based Assessment. In D. Jonson & K. Knogrith (Eds.), *Teaching Teachers to Use Technology* (pp. 131–150). New York: Haworth Press.
- Gibson, D. (2006b). ePortfolio decisions and dilemmas. *Handbook of Research on ePortfolios, 135–145*. Retrieved from

[http://books.google.com/books?hl=en&lr=&id=P3tJSOXYiQ0C&oi=fnd&pg=PA135&dq="teacher+education"+"D+Gibson"&ots=tt0Dt4wlwo&sig=EgU5zzL7KPiFAPAY2tX\\_iFRZufl](http://books.google.com/books?hl=en&lr=&id=P3tJSOXYiQ0C&oi=fnd&pg=PA135&dq=)

Gibson, D. (2012). Game Changers for Transforming Learning Environments. In F. Miller (Ed.), *Transforming Learning Environments: Strategies to Shape the Next Generation (Advances in Educational Administration, Volume 16)* (pp. 215 – 235). Emerald Group Publishing Ltd. doi:10.1108/S1479-3660(2012)0000016014

Halavais, A. M. C. (2011). A genealogy of badges: Inherited meaning and monstrous moral hybrids. *Information, Communication & Society*, 15(3), 354–373. doi:10.1080/1369118X.2011.641992

Hintz, R. (2009). *Science education in the boy scouts of America*. Retrieved from [http://www.eric.ed.gov/ERICWebPortal/search/recordDetails.jsp?ERICExtSearch\\_SearchValue\\_0=ED513200&searchtype=keyword&ERICExtSearch\\_SearchType\\_0=no&\\_pageLabel=RecordDetails&accno=ED513200&\\_nfls=false&source=ae](http://www.eric.ed.gov/ERICWebPortal/search/recordDetails.jsp?ERICExtSearch_SearchValue_0=ED513200&searchtype=keyword&ERICExtSearch_SearchType_0=no&_pageLabel=RecordDetails&accno=ED513200&_nfls=false&source=ae)

ISO/IEC. (2004). Portable Network Graphics (PNG): Functional specification. *ISO/IEC 15948:2004*. Retrieved May 26, 2013, from [http://www.iso.org/iso/catalogue\\_detail.htm?csnumber=29581](http://www.iso.org/iso/catalogue_detail.htm?csnumber=29581)

Jakobsson, M. (2011). The Achievement Machine: Understanding Xbox 360 Achievements in Gaming Practices. *Game Studies*. Retrieved May 26, 2013, from <http://gamestudies.org/1101/articles/jakobsson>

Mayrath, M., Clarke-Midura, J., & Robinson, D. (2011). *Technology-Based Assessments for 21st Century Skills: Theoretical and Practical Implications from Modern Research* (p. 386). IAP.

McDonald, D., Javanmardi, S., & Zachry, M. (2011). Finding patterns in behavioral observations by automatically labeling forms of Wikiwork in Barnstars. In *WikiSym 2011: Proceedings of the 7th International Symposium on Wikis and Open Collaboration* (pp. 15–24). New York: ACM.

Mozilla. (n.d.). Badges. (Authors:, Ed.)*Mozilla Wiki*. The Mozilla Foundation and Peer 2 Peer University, in collaboration with The MacArthur Foundation. Retrieved from <https://wiki.mozilla.org/Badges>

OED. (2013). Badge. *Oxford English Dictionary Online*. Oxford University Press. Retrieved from <http://www.oed.com/view/Entry/14550?result=1&rskey=NfSUUz&>

Surman, M. (2011). Mozilla Launches Open Badges Project. *Commonspace on WordPress.com*. Retrieved May 26, 2013, from <http://commonsplace.wordpress.com/2011/09/15/openbadges-2/>