Advancing Sustainable Educational Ecosystems with Open Digital Credentials and Badges


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Short Abstract
Most existing practices for grading student work, measuring readiness, documenting accomplishment, and accrediting programs and schools are analog and opaque. This makes it difficult for programs, schools, and communities to adopt the innovations described in the other chapters of this volume. Open digital badges can contain specific claims of competency, along with web enable evidence supporting those claims. This information can then circulate in social networks and gain additional meaning. Examples from sustainable, sustainability, and open education are used to illustrate how open badges are being used to help find, acknowledge, recognize, motivate, and endorse learning.

Abstract
Directly or indirectly, credentialing practices influence many other aspects of educational ecosystems. These include grading student work, measuring readiness, documenting accomplishment, motivating engagement, and accrediting programs and schools. Most current practices for measuring, credentialing, motivating, and accrediting are organized around achievement. Most of these practices rely on analog technologies and are quite opaque for most stakeholders. This makes these practices expensive, inefficient, and entrenched. Therefore, existing credentialing practices are a significant obstacle for accomplishing the educational transformations suggested by the other chapters in this volume. This chapter describes a promising response to the problems created by existing credentialing practices. This response is open digital credentials and, in particular, open digital badges. Open credentials are different than conventional credentials because they can contain specific claims of competency, along with evidence supporting those claims. Importantly, this evidence can include web-enabled links to additional evidence such as completed student work and endorsements from individuals and organizations; equally important, badges and the claims and evidence they contain can circulate in social networks where they can gain additional meaning and value. This chapter uses actual examples to summarize how digital badges might be used to support the digital transformation of sustainable educational ecosystems and education for the achievement of the Sustainable Development Goals. This exploration is organized around five distinct functions of open digital badges: finding, capturing, recognizing, motivating, and endorsing learning.
Supporting Educational Transformations Through
Open Digital Credentials and Badges

In both developing and developed countries there is growing interest in moving traditional classroom-based learning into online, open, blended, and mobile educational ecosystems to expand educational access and reduce costs. The various chapters in this volume illustrate the many ways that innovators are aiming to support these transformations. These transformations will help accomplish UNESCO’s Sustainable Development Goal 4, *ensure inclusive and equitable quality education and promote lifelong learning opportunities for all* and more generally support educational efforts associated with attainment of all seventeen of the Sustainable Development Goals (SDGs).

This chapter first discusses concerns that traditional credentialing practices will hinder the deployment of the innovations described in this volume. After summarizing broad responses to these concerns in the form of open digital credentials, the chapter focuses on one specific form of open digital credentials known as open digital badges (hereafter, open badges or simply, badges). These are web-enabled digital tokens of accomplishment (Grant, 2014). These accomplishments can include completion (e.g. of a course or a project), competence (i.e., mastery of specific competencies), and/or participation (e.g. in socially networked learning). Open badges are different from conventional “analog” credentials because they can contain web-enabled evidence that supports the badge’s claims of completion, competence, or participation. Furthermore, open badges can be readily shared over social networks where they can gain additional meaning (e.g., “likes” and the possibility of public repudiation). Many see open badges as a truly transformative credentialing technology that has important consequences for education and learning (e.g., Abedour, 2016). The bulk of this chapter uses examples associated with sustainable education and/or education in sustainability to illustrate five categories of functions that open badges can fulfil, including finding, assessing, recognizing, motivating, and credentialing learning.

**Challenges Presented by Traditional Credentials**

Credentials, in the form of grades, transcripts, diplomas, and degrees, are deeply ingrained in educational and employment systems today, supporting “hiring as investment under uncertainty” (Spence, 1974). From a historical point of view, credentials, such as college degrees, went from the valued possessions of a tiny elite to being held by a large portion of the population.

Current credentialing practices emerged gradually alongside other modern educational practices for admitting and advancing students, grading student work, credentialing graduates, hiring employees, and accrediting programs and schools. These practices co-evolved gradually over the
last century (Brown, 2001). And because this evolution took place privately and (mostly) tacitly, this has resulted in analog credentialing practices that are opaque for many stakeholders and are quite resistant to institutional change (Gallagher, 2018).

Responses to Concerns over Traditional Credentials

These concerns about traditional credentials were elaborated in a recent report from UNESCO (Chakroun & Keevy, 2018). The report summarized “new and emerging trends” that show promise in addressing these concerns, including digital badges. The other trends that are relevant to badges and our discussion of them include micro-credentialing (breaking up of traditional “macro-credentials” into smaller subunits that could accumulate into larger credentials), digital learners’ record repository (such as the European Credit Transfer System), the aforementioned open education (including open universities that confer degrees and are accredited, and open learning which might or might not be associated with certificates of completion, but which does not lead to degrees), and technology standards (such as the Europass Digital Credentials Infrastructure that define the metadata standards for educational credentials in Europe, the global Open Badge Infrastructure specifications described below, and the global Learning Tools Interoperability standards that simplify the integration of tools like badges into learning management systems).

Unlike these other trends, digital badges represent a more specific technology that can be embraced at a very small scale, such as a single course or educational program. This makes badges an ideal starting point for those who wish to initiate the digital transformation of sustainable education. Open badges may be considered as an empowering technology, which allows anyone to start a digital transformation from bottom-up (Buchem, Brunn & Orr, 2019). Put differently, open badges can be used to transform a modest course or program into a digital credentials ecosystem that supports some of the functions of the large-scale ecosystem envisioned in the UNESCO report.

Varied Functions of Open Digital Badges

To illustrate the transformative potential of open badges, examples are drawn from two educational programs. One is UNESCO’s Food and Agriculture Organization e-Learning Academy. The Academy has published over 70 self-paced online courses targeting one or more of the SDGs. In most courses, learners are required to score at least 75% on well-designed quizzes to earn a digital badge. Figure 1 displays the badge that the first author earned after completing one of the courses.

[Insert Figure 1 about here]

1 https://elearning.fao.org/
The second example comes from *Open Virtual Mobility* (OpenVM) founded by the European Commission under the Erasmus+ program (2017-2020). The second author is the coordinator of this strategic partnership which encompasses nine higher educational organizations working on promoting academic virtual mobility in higher education in Europe in the context of open education (Buchem et al., 2018). Figure 2 displays a badge issued to learners who complete one of OpenVM’s massive open online courses (MOOCs).

![Insert Figure 2 about here]

The examples in Figures 1 and 2 illustrate two key features of open digital badges. First, the bolded terms (*name, issuer name, etc.*) illustrate some of the *metadata* specifications that make up the *Open Badges Infrastructure* (OBI, currently Version 2.0). Badges that embrace these specifications are *interoperable* (readable by humans and computers on any platform that embraces those specifications) and *extensible* (backward compatible with earlier versions). This makes it possible for multiple organization to create individualized badging platforms that all read and display the contents of each metadata field in the intended manner and continue to do so for badges issued using earlier versions of the standards.

Second, the examples illustrate how the actual instance of the badge contains unique information in each of the metadata fields. In technical terms, Figures 1 and 2 are displaying *Assertions* of the underlying *BadgeClasses*. In non-technical terms, the BadgeClass is the badge that was designed by the individual by inserting information into some of the metadata fields and making that badge available for earners; the assertion is the badge that was issued to an individual earner when additional information (e.g., earner’s name and email address was inserted into the corresponding metadata fields). When these assertions were created, the information in the metadata fields was embedded in those fields in a PNG (portable network graphics) image file. This is important because PNG files can reside “in” the Internet without being stored on an actual server. However, it is necessary for the additional information that the badge metadata links point to be stored or a server for those links to remain functional.

Other examples of badge systems in sustainable education include those associated with *Teach the Global Goals* courses offered by Participate.com, the *Achievement Programme of the UNESCO Associated Schools* (Kriauciaunas, 2016), sustainable development in traditional mountain communities (Gwin & Foggin, 2020), and sustainable teaching practices in university instruction (Liu & Northover, 2014).

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2 https://www.openvirtualmobility.eu/
3 https://app.participate.com/communities/teach-the-global-goals/0f23864f-bd16-4f68-b9b1-3846cc441fc1/courses
Open Badges for Finding Learning

The first potentially transformative function of open badges is helping individuals find opportunities to learn. As shown in Figure 3, the first author shared the badge in Figure 1 over Facebook where it generated likes and multiple comments from the author’s Facebook friends. Notably, several of the comments included recommendations that other Facebook friends consider the FAO Academy. Because some of these friends were not friends with the author, they otherwise would not have seen the badge. Another comment recommended a specific course for a specific friend. These highly personalized interactions have important implications for helping individuals find relevant opportunities to learn.

As the badge in Figure 1 is embedded in the FAO home page, views have ready access to opportunities to learn, including a direct registration links for academy. The badge in Figure 2 has similar links, along with searchable tags that might help other individuals find this badge and these opportunities.

Open Badges for Capturing Learning

A second set of potentially transformative functions of digital badges is capturing evidence of learning. This function has traditionally been associated with educational assessment and achievement testing.

Capturing Richer Evidence of Learning Contexts

Both example badges contain extensive information about the context in which that badge was earned, and links to additional information for viewers for whom this information is meaningful. For example, a viewer of the badge in Figure 1 might follow the links to all the courses at the FAO academy. This page reveals that the badge in Figure 1 was earned for completing a course that was estimated to require 2 hours to complete, while there are other courses estimated to require as many as 23 hours to complete. Similarly, the badge in Figure 2 contains a link to the page in displayed in Figure 4 which contains additional information about the educational program, the specific course, the skills gained, and the criteria for earning the badge. For some viewers (e.g., a potential employer or an educator who wishes to give the earner course credit), this information might be quite meaningful. Significantly, information about the links in the badges and the linked pages makes this information more navigable because it allows viewers to “drill down” without getting lost.
Capturing Broader Evidence of Individual Learning

In addition to capturing rich information about the context of learning, digital badges can capture much broader evidence of competencies than is otherwise practical. For example, the FAO badge includes information about the passing quiz score that was necessary to earn the badge along with the date that badge was earned.

The example of the OpenVM badge shows how digital badges can capture a broader set of individual competencies such as “being open minded and tolerant” as shown in Figure 4. The OpenVM badge "open Mindedness" lists the criteria for earning the badge under the link in the criteria field. The criteria include the completion of a reading activity, sharing of own understanding and reflections, commenting on peers’ posts in the discussion forum and the successful completion of the e-assessment. This example illustrates one of the many decisions that must be made when designing a badge system, including the form of evidence of learning to be captured as a prerequisite to issue the badge and how this is expressed in the criteria field.

Capturing Evidence of Social Learning

With conventional credentials, it is difficult to capture evidence of “social” learning in the form of participation in subject related interactions with other learners. Capturing evidence of social learning with conventional credentials usually require instructors to assess and grade that learning. But doing so is laborious and can readily undermine that learning (by turning meaningful discussion into a routine and rather rigid “assignment”).

Figure 4 shows that the second criteria for earning the OpenVM badge was sharing work and participating in discussion forums, but without capturing actual evidence of that sharing and discussions. Going a step further, the badges earned in the open online course on educational assessment described in Hickey and Uttamchandani (2019) included the number of comments included in threaded comments posted on learner-generated artifacts; clicking on the number of comments in those badges took the viewer to the actual threaded discussions on the artifact where they were posted.

Readers are reminded that capturing actual evidence of participation in social learning presents technological and privacy challenges. But innovators should seriously consider taking advantage of this unique function of open badges. Hickey and Chartrand (2020) found that badge systems that captured evidence of social learning were much more likely to establish thriving ecosystems than those that only captured evidence of individual competence and/or completion.

Capturing Evidence from Learning Pathways

Related to the micro-credentials introduced above, badges can be used to define and then capture evidence from learning pathways consisting of multiple badges. The OpenVM project included eight such pathways comprised of foundational, intermediate, and advanced courses and
associated badges. As such, the badge in Figure 2 is the first of three badges in the Open Mindedness pathway. Alternatively, OpenVM learners were invited to create their own pathways by completing the foundational badges in three of the eight areas. Technical limitations of the OpenVM LMS and badging tool (Moodle and Bestr) made it too difficult to represent the pathway visually or embed the badges in a “meta-badge.” However, the popular Badgr.io platform enables innovators to easily create badge pathways, display the pathway visually along with the learner’s progress, and create metabadges that contains a link to that visual representation (Otto, 2017).

Open Badges for Recognizing Learning

While related to the capturing functions above, digital badges serve distinct functions associated with the recognition of learning. Whereas capturing refers to obtaining evidence of learning, recognition functions concern displaying that evidence to others. Recognition is akin to the credentialing practices associated with giving grades for completing assignments and courses and awarding certificates and degrees for completing programs of study.

Recognizing a Broader Range of Competencies
To reiterate, traditional credentials are primarily associated with achievement. The ability to recognize a much broader range of competencies is one of the most obvious transformative functions of open badges. Extending the discussion of about capturing evidence of social learning, digital badges are ideally suited to recognizing these broader forms of learning. This is immediately relevant to the so-called “21st Century” competencies like collaboration and teamwork that are associated with interaction in networked digital learning environments. Such competencies are difficult to recognize with conventional credentials because they are deeply contextual (situated in and distributed across contexts).

While the FAO badge recognized relatively conventional competencies, the criteria page for the OpenVM badge in Figure 4 made claims about individual and social competencies. To reiterate the point made above, the OpenVM badges did not capture actual evidence of social learning, so this recognition is relatively indirect. This means that the badge viewer needs to trust the issuer’s assertion about the accomplishment. In contrast, the links to the threaded conversation in the open assessment course introduced above made it possible to include “productively discuss” as one of the competencies that was directly recognized.

Recognizing Learning Openly
Both example badges above are specifically associated with open learning opportunities and were specifically designed to recognize that learning openly. This open recognition contrasts with conventional credentials that are usually private documents and where significant effort is directed at security and the need to ensure that the credential was genuine. This made sense in
the past given the value of degrees, the potential consequences of documented success in school, and the ease with which authentic-looking fraudulent credentials could be obtained. Readers should note that the Open VM badge in Figure 2 contains an indication that a third party verified the credibility of the badge. This illustrates one of the new features of the OBI Specifications 2.0 that is intended to help address concerns that the earlier specifications made it possible to for individuals to issue themselves official-looking badges from actual organization (e.g., Matthews, 2016).

The centrality of open recognition is highlighted by the name open digital badges. This function is perhaps that most likely to larger educational ecosystems, by making them more open as well. As Bonk pointed out in The World is Open:

> While learning is being opened up to masses of people that previously did not have access, it is also opening up in new forms to those who already did. Learners of all ages are increasingly engaged in formal as well as informal learning, which is highly mobile and often ubiquitous. (2009, p. 49).

In What Counts as Learning, Grant explained how the open nature of badges supported this trend towards open education:

> In our current system, a limited number of people see the criteria or evidence for how grades and degrees were earned. Badges, however, are transparent and information-rich. Everything is bundled into one click, allowing us to see what someone did to earn the credential, including a link to the evidence behind the learning, maybe a testimonial from the instructor, comments from peers, or even an endorsement from an expert. (2014, p. 7)

The transformative potential of open recognition of learning was explicitly recognized in the 2016 Bologna Open Recognition Declaration4. The title of this declaration reflects the relevance of badges to the ambitious (and ultimately problematic) effort to standardize conventional higher education credentials across Europe known as the Bologna Process.

**Open Badges for Motivating Learning**

An obvious “secondary” function of capturing and openly recognizing learning is motivating that learning. But some skeptics have argued that badges function as “extrinsic rewards” (e.g., Resnick, 2012), which have been shown to undermine “intrinsic” motivation and self-determination. This occurs via the “overjustification effect whereby the expected extrinsic reward suppresses the intrinsic satisfaction experienced when engaging in a previously unrewarded activity (Tang & Hall, 1995). The debate over extrinsic incentives has simmered

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4. [https://www.openrecognition.org/bord/](https://www.openrecognition.org/bord/)
since the “cognitive revolution” (e.g., Deci, 1971) and is rooted in the larger tensions between older behaviorist theories of learning and modern cognitive theories. Behavioral theorists considered rewards useful for motivating sufficient initial competency (e.g., grammar) so that learners could eventually experience the satisfaction of success at a larger task (i.e., reading an entire book). Cognitive theorists worried that the overjustification effect would lead such learners to not choose to engage in the larger tasks in the absence of an extrinsic reward.

The extended discussion of this issue in Hickey and Schenke (2019) concedes that digital badges can and sometimes are used as information-free “tokens” like those used in the prior reward studies. However, badges need not be used in this way and most open badges contain much more information than grades and other credentials. This minimizes the likelihood that badges will be perceived as arbitrary and controlling (which is what undermines intrinsic motivation). Furthermore, circulation in digital networks allows open badges to gain additional meaning. Hickey and Schenke further argue that the negative consequences of extrinsic rewards in previous studies were likely overstated (because they ignored social and cultural forms of motivation) and that understanding the full motivational function of digital badges may require using newer “situative” theories of motivation (e.g., Hickey & Zuiker, 2005). These theories focus primarily on social and cultural forms of motivation, while treating both behavioral and cognitive forms of motivation as “special cases” of social and cultural motivation.

**Open Badges for Endorsing Learning**

The fifth potentially transformative function for badges is perhaps the least understood. The *endorsement* of learning is traditionally associated with *accreditation*, where “third parties” review and verify the quality of schools and educational programs, along with achievement represented by the degrees and credentials conferred. In the earlier OBI Specification 1.1, badges were tacitly endorsed by whoever issued the badges. As elaborated in Hickey and Otto (2017), Specifications 2.0 include several explicit endorsement features. Once organizations or individuals have been given a web “profile” by the badge issuer, it is possible for a BadgeClass to be endorsed before it is issued (e.g., by the organization). Each assertion of that BadgeClass can then be endorsed (e.g., by a member of that organization, perhaps after reviewing the evidence contained in the badge). Importantly, the endorsing organization or individual can add an endorsing statement, giving additional meaning to the endorsement.

Figure 5 shows the endorsement statement that is displayed below the skills and criteria information shown in Figure 4. This shows that the badge was endorsed by an organization (The European Distance and E-Learning Network, EDEN) and shows the endorsing statement. Clicking on the endorsement takes the badge viewer to the profile that the issuer established for the endorser. Readers should note that this is a relatively standard endorsement; a more sophisticated endorsement might state how and when the organization reviewed the curriculum.
and assessments associated with the badge. OpenVM badges opted to not add endorsements to the individual badge Assertions. This illustrates an important feature of the Open Badge Infrastructure specifications. For many of metadata fields, designers can decide whether the name of the field is displayed or hidden when the field is empty. This is important because an empty field can mean something very different than a non-existent field, particularly with endorsements.

**Summary and Recommendations**

This chapter provided a brief overview of five different functions of open digital badges that promise to support the digital transformation of sustainable/sustainability education. These functions promise to help transform learning by helping individuals in search of learning and institutions offering learning connect with each other, making learning and recognition of learning more portable, and allowing institutions to be nimbler in their educational offerings. These and many other such transformations are detailed in other chapters in this volume.

To reiterate, innovators are encouraged to treat open badges as a starting point for these transformations. Perhaps the most useful advice is the unattributed aphorism from the tech world “Think big, start small, work fast.” Badges appear particularly successful at supporting thriving ecosystems when used to recognize open and social learning, and innovators are encouraged to start there; conversely badges have been found to be less successful when they are associated with extensive requirements for assessing individual competency or project completion, or when they are used to recognize learning that is also recognized by formal credentials (Hickey & Chartrand, 2020).

Finally, innovators are cautioned to be patient. In 2017, Hickey pointed out that “e-credentials” were at roughly the same state of development as e-commerce was in 1997. At that time, many traditional retailers and publishers were dismissing e-commerce as a “fad.” It took ten more years for the necessary “trust network” to emerge (primarily around new consumer review features) that allowed e-commerce to flourish. It might take until 2017 for a similar trust network to emerge around open badges or some other form of open digital credentials (presumably around endorsement functions described above). Educational institutions that are currently ignoring digital credentials may end up in the same tenuous position currently facing retailers and publishers who were slow to embrace e-commerce.
References


Brown, D. K. ‘The social sources of educational credentialism: Status cultures, labor markets, and organizations,’ *Sociology of Education* (74), p19-34.


Kriaicoimas, N. (2016). *Achievement programme of the UNESCO Associated Schools in Lithuania*. Available at: https://issuu.com/nerijuskriauciu纳斯/docs/recommendations_for_unesco_achievem


Figure 1. Example Badge from UNESCO FAO Academy
Figure 2. Example Badge from Open Virtual Mobility (Open VM) Project
Figure 3. Example of a Badge Helping Others Find Opportunities to Learn

Daniel Hickey
June 18, 0

Just learned about the UNESCO Food and Agriculture Organization’s eLearning Academy. Their 80 Flash-based courses are some of the best self-pace non-credit courses I have ever seen. I had to work plenty hard to earn this badge.

ELEARNING.FAO.ORG
Issued badge information

Daniel Hickey

But that is kinda lame. It does not display the badge image or information. This was partly a test. But you can click on the link to see the information

Like · Reply · View

Daniel Hickey

Hey friends who are interested in sustainable development, open learning, or digital badges. I just completed one of the shorter courses at the UNESCO Food and Agriculture Organization. I earned this digital badge for doing so. I thought the courses ...

See More

Like · Reply · View

Meryl W
San Francisco, CA · 9h

this is worth a look

Like · Reply · View

Meryl W
Sherry Lerner, Denver, CO · 10h

this is worth a look

Like · Reply · View

Meryl W

Daniel Hickey I will take one ASAP

Like · Reply · View

Daniel Hickey

Awesome. I have long been fascinated by self-paced online “compliance courses” and one of my students is thinking about studying them for her dissertation. Most of them are terrible and are subject to CAMEO cheating (Copying Answers from Multiple Existences Online). At least in the course I took, you can’t cheat that way. Somebody needs to study these to provide evidence to that effect to increase the value and credibility of the badges

Like · Reply · View

Meryl W

Look at this post AND this course, Meryl B https://elearning.fao.org/course/view.php?id=325

ELEARNING.FAO.ORG

Experience Capitalization for Continuous Learning

Like · Reply · View

Amanda G

Carroll, IA · 11h

Like · Reply · View

Write a reply...

Vera D

These are great, Dan! I started taking Sustainable food value chains for nutrition. I wish they were a bit more mobile-friendly but great on another device. I like how the lessons are organized, and, as a language educator, I love that some of the courses are available in multiple languages. Thanks for sharing!

Like · Reply · View

Write a comment...
Open mindedness - Foundation Level

This digital credential "Open mindedness Foundation Level" certifies that the owner masters the Open mindedness competences at foundation level.

The digital credential is issued after successful completion of the Foundation Level Course in Open Mindedness in the OpenVM Learning Hub.

Designed by the Open Virtual Mobility Erasmus+ project, the Foundation Level Pathway in Open Mindedness MOOC provides teachers, students and other stakeholders in higher education with skills and attitudes of open mindedness relevant for successful engagement in virtual mobility, such as:

1. awareness of possible differences in interaction with peers and teaching staff at other institutions;
2. understanding what Open Mindedness is, its relevance and how it is different from closed mindedness.

Skills

This digital credential certifies that the person who attended the Foundation Level Pathway in Open Mindedness MOOC in the OpenVM Learning Hub is able to:

- demonstrate awareness of possible differences in interaction with peers and teaching staff at other institutions;
- demonstrate understanding what Open Mindedness is, its relevance and how it is different from closed mindedness.

These skills correspond to the Foundation Level of Open mindedness competences described in the OpenVM Competency Framework as:

1. be open-minded and tolerant;
2. demonstrating self-confidence in interaction with peers and teaching staff;
3. showing willingness to improve proficiency in foreign languages.

Criteria

The digital credential is issued after successful completion of the foundation level Pathway in Open Mindedness Credential MOOC in the OpenVM Learning Hub.

To earn the "Open mindedness Foundation Level" Credential the learner must have:

1. read the content and watched the videos on the definition of the concept of Open Mindedness and on how to assess how much an argument is open minded;
2. shared his/her understanding and reflections and commented peers’ posts in the discussion forum;
3. successfully passed the e-assessment.
Figure 5. Issuance Data and Endorsement for Badge for Open VM Badge in Figure 2