2018-03-01

Examining the Use of Open Badges to Respond to Challenges of an Undergraduate Technology Course for Secondary Education Majors

Daniel Lee Randall
Brigham Young University

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Daniel Lee Randall, Jr.

A dissertation submitted to the faculty of
Brigham Young University
in partial fulfillment of the requirements for the degree of

Doctor of Philosophy

Richard E. West, Chair
David Wiley
Randall Davies
Peter J. Rich
Michael C. Johnson

Department of Instructional Psychology and Technology

Brigham Young University

ABSTRACT

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Daniel Lee Randall, Jr.
Department of Instructional Psychology and Technology, BYU
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In this dissertation, the creation and iterative improvement of an open badge system for an undergraduate preservice educational technology course is examined through 3 journal-ready articles. In article 1, we detail the design, development and implementation of the badge system and demonstrate how an open badge system could help meet the challenges facing the course. Several future design implications are identified, including how to scale the badge system while maintaining quality control and how to achieve financial sustainability. Future research implications include determining if awarding badges provide students with additional motivation and what employers' perceptions of badges might be.

Article 2 examines how undergraduate instructional design assistants (IDAs) could be used to affordably scale our badge system. External reviews determined that IDAs can create badge rubrics at a similar level as instructors, allowing us to create far more badges than we could without their help. IDAs also reported that the experience benefitted them by giving them increased technology skills and room for professional growth. While most of the IDAs were excited about the benefits of open badges, none chose to share their badges with prospective employers, largely due to concerns about how to display them or about whether principals would understand their value.

In article 3, we look at employers' perceptions of open badges. We emailed 1 of 2 forms of a survey to 577 principals and assistant principals in 5 school districts. Form A used wording about digital badges while form B used the term microcredentials. We compared the results of the surveys using the Mann-Whitney *U* test and the sign test. We also qualitatively examined the results of the open-ended questions using constant comparison analysis. We found that using the term microcredential instead of the term digital badge does not have a significant effect on employers' perceptions on open badges. However, providing a small amount of instruction regarding the affordances of open badges does produce a statistically significant difference in the perceived value of open badges. Employers see the most value in achievement and capability badges. Most employers believed badges would be useful in the hiring process, but many worried about the challenge of having too much data. Finally, we found that many employers think that badges could be useful in professional development.

Keywords: open badges, digital badges, microcredentials, technology integration, teaching assistants, employer perceptions

ACKNOWLEDGEMENTS

I would like to thank Dr. Richard West and my other committee members for their support, guidance, patience, and encouragement throughout my time in the department of Instructional Psychology and Technology, and especially while I was writing this dissertation. I would also like to thank my parents, Dan and Joyce Randall, for their support and encouragement throughout this endeavor. A special thank you goes to Barbara Badgett for helping with some of the statistical analyses. Finally, I wish to thank the many friends and family members who have encouraged me and supported me as I labored to write my dissertation.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION AND STRUCTURE OF THE DISSERTATION

Open badges have been touted to address many challenges faced in twenty-first century learning (Brandon, 2013; Goligoski, 2012; Grant, 2014; Moore, 2013). While open badges were initially created for use in nontraditional learning environments, they can be used in any learning environment, including an undergraduate course at a traditional university. In this dissertation, I will examine how open badges can be used to address the challenges of an undergraduate course on technology integration (IPT 286). The process I follow will include the use of design-based research, which requires multiple iterations of design and development. Two research articles and a literature review article make up the body of this research. Each article will report on some iteration in the project, or on additional research needed to improve the overall design of the badge system.

Challenges Faced in IPT 286

IPT 286 is a one-credit undergraduate course for secondary education majors on how to integrate technology into teaching. While very useful to undergraduate teaching majors, the circumstances of the course provide several instructional challenges.

Differentiating Instruction

The course typically carries five sections and serves students in over 15 teaching majors. Since these majors are often intermixed within a section, one instructional challenge of the course is being able to differentiate instruction so that it is relevant in each of these content areas. In the past, sections were organized by teaching major, with similar majors grouped into a section (e.g., history, social studies, and English were all a section together). While this approach allowed instructors to focus the content of the course more specifically on those content areas, this system did not fully resolve the challenge. Even with groups of similar

teaching majors, differentiating instruction was a challenge, such as how to teach technologies that were very useful to one major but were still not as relevant to another. Additionally, regardless of when the course was scheduled, it inevitably overlapped with classes in one of the departments that that section was meant to serve (e.g., the section of IPT that serves students in history, social studies, and English might meet at the same time as a class offered by the history department). Consequently, at least a few students would not be able to enroll in the section of IPT 286 meant for their major and would have to sign up for a section meant for another group of majors, further contributing to the challenge of differentiating instruction.

A further challenge to differentiating instruction was that the course also served students with a wide degree of technology skills. Some students struggled with technology use and needed a great deal of coaching to complete their projects. On the other end of the spectrum were students who seemed unchallenged by the technologies they were asked to learn, or at least required so little help that requiring them to come to class simply to be present while working on their project seemed to be an unnecessary burden. Between these two extremes were students with varying levels of skill and confidence who required different amounts of coaching at different times throughout the course.

One-Credit Course

Beyond the difficulties of differentiating instruction, the course is only one credit, whereas similar courses at other universities are three credits. As technology becomes more ubiquitous in everyday life, the need to effectively use technology in teaching is growing. This is especially true as more and more schools purchase iPads, Chromebooks, and other devices to support learning. Teachers who do not have the skills to effectively teach with technology may struggle to obtain and retain employment, making the skills taught in 286 critical for the success

of our current students. With only one credit, the challenge becomes what we can do to provide our students with the skills they need to be successful in the classroom and be competitive in the job market.

Open Badges

Open badges provide one possible way to address the challenges facing IPT 286. In this section I will provide a brief overview of open badges and how they could be used to support IPT 286. A more detailed explanation of open badges, together with how they will be used in IPT 286 will be the focus of article 1.

Introduction to Open Badges

The use of physical badges to recognize accomplishments, skills, ranks, and positions in a community is hardly a new concept. Some of the more obvious examples are the use of badges in scouting programs, such as the Boy Scouts of America, as well as the use of badges in military and law enforcement agencies. The use of digital badges, where a digital image is used instead of a physical badge, has become prevalent in recent years. The use of digital badges in education can be seen in such systems as Khan Academy and Duolingo where they are used to represent knowledge gained, skills learned, or accomplishments achieved. Badges often act as a motivator in such systems as well (Abramovich, Schunn, & Higashi, 2013).

One type of digital badge, the open badge, provides affordances beyond that which could be offered by traditional badges (Brandon, 2013). Created by the Mozilla Foundation, open badges are a type of microcredential represented by a digital image with metadata. This metadata prevents the badge from being forged and provides information about the badge such as the badge name, a brief description of what the badge represents, and information about who issued the badge, including a link to the issuer's website. Perhaps the most significant metadata

contained in a badge is a link to the criteria required to earn the badge and a link to evidence that the learner has met the criteria. This evidence could take the form of a completed project or similar product, a test score, assignment(s), or any other number of things that provide evidence that the criteria required to earn the badge was met. In this way, a collection of open badges can act as a type of digital portfolio, with each badge being one piece in the portfolio. Each badge allows the viewer to dig much deeper into the data about the badge than is possible with a traditional credential or transcript. By comparing the criteria provided with the completed product (e.g., the evidence) a viewer that was unsure of a badge's validity could essentially re-assess the project to ensure that the desired abilities were demonstrated. The added transparency provided by open badges means that the viewer need not take a badge at face value (although a badge issuer's brand, just like a university's name, could eventually earn credibility and give face validity to any badge with that brand).

The robustness of the data an open badge can provide gives open badges the potential to be highly credible. This credibility contrasts with other attempts to digitally recognize skills, such as LinkedIn's skill endorsement feature. LinkedIn's system encourages users in a person's network to endorse a person in various skills without providing evidence that the person has those skills (LinkedIn, 2017). Additionally, there is no evidence that the endorser knows enough about the person's abilities to be able to appropriately endorse their skills. This can lead to a person being endorsed for skills they do not have or can do only poorly. While the amount of people endorsing an individual in a skill adds some credibility, the reliability of the endorsement remains suspect without the kind of evidence an open badge can supply. For these reasons, many recruiters see little to no value in LinkedIn's endorsements (Adams, 2013).

Another important aspect of open badges is that they rely on an open source infrastructure, meaning anyone is free to utilize open badges. This also means that the open badge credential can live on any supported platform (Grant, 2014), unlike credentials from Khan Academy or LinkedIn, which prevent credential holders from displaying their credentials anywhere but the site that issued it. To ensure the open badge ecosystem can continue to operate, IMS Global assumed responsibility for the continued development of the open badge specification in January of 2017 (IMS Global, 2017a). In March of 2017 version 2.0 of the open badge specification was released. This included a new endorsement field that allows professional organizations and other groups to certify the value of a badge. It also included other improvements such as the ability to embed the criteria and evidence fields directly into the badge, so users no longer have to rely on URL links (Belshaw, 2017; IMS Global, 2017b).

As with any microcredential, open badges are simply a type of credential, separate from assessments and instructional pieces. However, badges are frequently used to modularize curriculum, with each module being represented by a badge (Reid, Paster, & Abramovich, 2015). The badge is earned by successfully completing the module, usually by meeting some criteria or passing an assessment. As a result, badges are often spoken of as if they are tied to an assessment. When I speak of badges throughout this dissertation, I assume badges are tied to assessments. When used to modularize curriculum in this manner, the collection of badges representing all the modules is collectively known as a badge system (Reid, Paster, & Abramovich, 2015). Since open badges are a type of microcredential, I occasionally use the terms synonymously, especially in article three where I investigate if using one term over the other affects employers' perceptions of open badges and found that it did not.

Open Badges in IPT 286

One way to address the challenges facing IPT 286 could be the implementation of an open badge system to support students both during their time in the course and after they complete the course. Such a badge system would make it easier to provide differentiated instruction, providing more support for students who struggle with technology, but allowing technology-savvy students more freedom to work independently. Open badges can also support students with superior technology skills by providing these students with additional, more challenging options for meeting a project's requirements. Similarly, an open badge system could also make it easier to support multiple content areas, allowing for further differentiation of instruction. Finally, this system could also support students once they finish 286 by allowing them to continue learning and earning badges. Students would not be limited to one credit's worth of instructional content and support but could receive the same benefits as students in three-credit courses, or even beyond, as this support could even be extended to alumni. Making badges available to our alumni would allow them to keep their technology skills current as technologies change over time (consider how many versions of Microsoft Office there have been!) and allow them to learn new technologies they might not have been aware of before they began teaching but that are now available to them.

Iterating by Design: Developing with Design-Based Research in Mind

Although badges, in one form or another, are nothing new, using open badges extensively to support learning in a blended undergraduate course was a recent innovation, perhaps even an unprecedented one. As a result, we had very little literature to draw upon to inform the design of the badge system. In response to this situation, we decided the best approach would be to use multiple iterations of design and development coupled with collecting data from students for use

in refining our design. We decided to use design-based research principles as they aligned with our design and development plan. Anderson and Shattuck (2012) identified several principles key to a successful design-based research study, including (a) having the study "situated in a real educational context" (p. 16), (b) "focusing on design and testing of a significant intervention" (p. 16), (c) "involving multiple iterations" (p. 17), and (d) the "evolution of design principles" (p. 17).

A Review of Design-Based Research Literature

Simon (1996) made a distinction within scientific inquiry, classifying some fields of study as natural sciences (e.g., sciences that study natural objects or phenomena) and other fields as artifical sciences (e.g., fields that study man-made objects or phenomena), and argued for the need of more rigorous theory within the latter. Included in the artifical sciences was the field of education. Collins, Joseph, and Bielaczyc (2004) agreed with Simon's argument and distinction, but preferred the term "design sciences" over the "artificial sciences," as this new label implies the need within education to "investigate how different learning-environment designs affect dependent variables in teaching and learning" (p. 17).

Sandoval and Bell (2004) also argued that research in education has struggled. This, they believed, was the result of attempts to isolate the intervention from its context to create "scientifically sound, generalizable knowledge" (p. 199). While such practices—used in the natural sciences—produce knowledge that might be "scientific in one sense," this knowledge fails to "adequately explain or predict the phenomena" (p. 199) it claims to address, making it difficult to apply theory to practice. They noted, "an educational psychology that is both usable in a practical sense and scientifically trustworthy cannot proceed without directly studying the phenomena it hopes to explain in its inherent messiness" (p. 199). Sandoval and Bell believed

design-based research provides a methodology that is capable of doing this in that it "simultaneously pursues the goals of developing effective learning environments and using such environments as natural laboratories to study learning and teaching" (p. 200). Similarly, Hoadley (2004) stated that the goal of empirical research is to "model and predict" (p. 203) what we find in the real world and argues that design-based research can enable that more accurately in educational research than can methods which remove the intervention from the context of the learning.

A key aspect of the design-based research model is the cyclical approach to refining all aspects of the design-based research process (Collins et al., 2004). As seen in Figure 1, Kennedy-Clark (2013) noted that design-based research uses a "cycle of reflection, evaluation and refinement" (p. 29) to more clearly define the problem, develop design principles, and refine theory. In contrast, predictive research focuses solely on the development and refinement of a hypothesis. Design-based research's continual process of refinement means designs themselves can become more robust, not just the theory behind the designs (Collins et al., 2004).

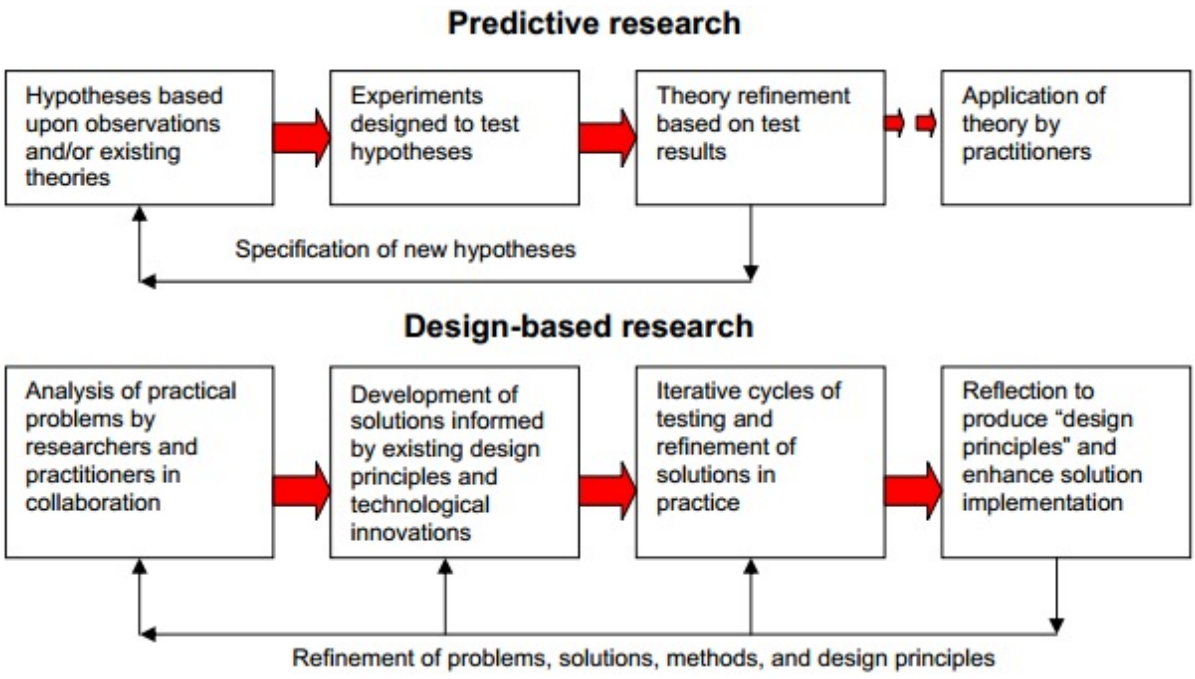

Figure 1. Design-based research compared to predictive research (Amiel & Reeves, 2008).

When contributing to theory, Hoadley (2004) noted that an important aspect of design-based research is the use of "tentative generalization" (p. 204). Collins et al. (2004) similarly referred to design-based research as "formative research" (p. 16). Thus, a single study might be one rung on the ladder leading to theory that is more refined and generalizable. As more studies are performed, the original generalization will likely be modified or improved to better represent reality. Even still, the knowledge generated may not be applicable in every learning environment as the notion that "universality is rare in educational phenomena" (Hoadley, 2004, p. 205) is a basis of design-based research.

Although the need for design-based research in education is clear, this does not mean that other research methodologies in education are obsolete. On the contrary, both qualitative and quantitative methods are both regularly used in design-based research. Even more traditional research studies can provide value as the theories such studies produce can be the basis of the designs that are tested in a learning context (Collins et al., 2004).

As previously mentioned, a key aspect of design-based research is its iterative nature. Collins et al. (2004) stated that if a design is not working, those involved in the study, which would include not just researchers, but also designers and even teachers, should consider how the design could be modified to meet the goal of the intervention. These changes should be made as often as they are needed to make the design work effectively. In this way, design-based research can utilize a rapid prototyping approach in much the same way as it is used in design thinking (Brown & Wyatt, 2010).

Collins et al. (2004) also noted some limitations of design-based research studies that result from the nature of the method. Since the study takes place in the messiness of the learning environment, there are a lot of varibles and not all of them can be controlled. This makes it difficult to determine which variable had what effect. Also, most design studies collect an immense amount of data, the majority of which cannot be properly analyzed because of the time or manpower that would be required to do so. With some data left unanalyzed, there is the possiblity that some important factor might be missed, further limiting the strength of the study's conclusions.

A final caution in regards to design-based research is that no design can account for every aspect of implementation, meaning every implementation of a design will be somewhat different depending on the stakeholders involved and the actions of the participants. As a result, an evaluation of a design can only apply to a specific implementation. This limitation means there's no way to be sure the same design will be effective in a different implementation (Collins et al., 2004).

Articles and Iterations

Following the practice of using multiple iterations in design-based research, the articles in this dissertation represent the iterative thinking and development of our open badging system for preservice education. The first article in this dissertation reports on the design and development of the first iteration of the badge system, along with some early feedback from students and instructors. The article also includes a brief discussion of the problems we recognized would need to be dealt with in future iterations. This article was published in 2013 in *TechTrends*.

Article two could best be described as iteration 1.5. It is not a complete redesign, but rather details the expansion of our badge system. It looks specifically at how we have addressed challenges identified in article 1, such as maintaining quality control during the creation of new badges and how to create more content-specific badges to further provide differentiated instruction. We tried several approaches before we found a solution to these challenges. For instance, some of the IPT 286 instructors attempted to make badge rubrics for content-specific technologies, but their lack of knowledge in the content area resulted in poor quality rubrics. We also had IPT 286 students create a new badge rubric for a technology in their content area as part of a class assignment, but similarly found these rubrics to be lacking. Finally, we were able to overcome these challenges by employing undergraduates as instructional design assistants (IDAs). Since IDAs were so fundamental to our solution, the focus of the article was how we overcame these challenges using IDAs. We also examined their experience serving as an IDA to show that utilizing undergraduates in this manner was mutually beneficial. We plan to submit this article to the *Journal of Technology and Teacher Education* (JTATE) or a similar publication that accepts qualitative research on teacher education and technology. This article

was written to meet JTATE's guidelines, including the requirement that manuscripts be no longer than 30 double-spaced pages. Appendices A and B will not be included in the publication, but Appendix C will be included.

The third article addresses employers' perceptions of open badges. The need for such a study stems from student feedback. One goal of the badge system was to encourage IPT 286 students to continue learning by earning badges after they completed the course. Part of the motivation to do this was predicated on the assumption that the badges would have value to prospective employers, particularly as they could more effectively communicate an applicant's skills (e.g., a hiring agent might be influenced in their decision by the badges a person has earned, or skills they can prove they have). However, an evaluation of the IPT 286 badge system from the students' perspective found that most students questioned the usefulness of badges when seeking employment (Tanner, 2015). Furthermore, a particularly troubling fact was that not even former IDAs who believed in the value of open badges presented their badges to hiring personnel because they thought principals would not know what to think of their badges (see article 2). While several articles have suggested badges could have such an influence on gaining employment (Brandon, 2013; Glover & Latif, 2013; Goligoski, 2012), little research has been done to validate this claim. Other outcomes of this study included the usefulness of different terminology, the value of various badge types, and the usefulness of badges in the hiring process and what could be done to improve their usefulness. These results can be used to create version 2.0 of our badge system, making it more useful to employers and subsequently more effective at motivating students. We plan to submit this article to a journal of educational technology, such as the *Australasian Journal of Educational Technology* (AJET) or *Educational Technology Research & Development* (ETR&D). The word limit for both journals is 8,000 words.

In addition to these articles that will comprise the formal chapters of my dissertation, I have assisted in other writing projects as part of this research agenda. These projects included a published framework for using open badges at an institutional level for member credentialing that was published in *American Journal of Evaluation* (Davies, Randall, & West, 2015), and a book chapter arguing the need for more rigor in the badging process (West & Randall, 2016).

Research Questions

Each article of this dissertation will address a specific issue or topic and have its own research questions. The following are the topics and questions for each article:

Article 1, how could open badges improve preservice instructional technology education?

1. How can open badges support existing university courses?
2. How can preservice instructors convert courses into badge systems?

Article 2, can we maintain quality while increasing the scale of our badge system using undergraduate instructional design assistants (IDAs) while also providing a beneficial experience for IDAs?

1. How effective were IDAs in creating quality assessment rubrics, and quality, well-aligned content?
2. What were the experiences IDAs had while creating these materials and how could IDAs' experiences be improved (e.g., what worked well, what could be better, and was the overall experience useful to them?).

Article 3, how do hiring personnel in elementary and secondary education perceive open badges and what could be done to increase the usefulness of an open badge system?

1. What are the initial perceptions of principals and other hiring personnel about open badges as a teacher credential? Does referring to them as microcredentials instead of open badges make a difference?
2. Does educating hiring personnel about open badges affect their perception?
3. What do principals most value when making hiring decisions? How can/would badges influence those decisions?
4. How could badge credentials be strengthened to carry more weight and influence with these persons?

Article #1: Giving Credit Where Credit Is Due:

Designing Open Badges for a Technology Integration Course

Giving Credit Where Credit Is Due:

Designing Open Badges for a Technology Integration Course

Published in *TechTrends*
(pre-publication version presented here)

Daniel L. Randall – dan.randall26@gmail.com
J. Buckley Harrison
Richard E. West
Brigham Young University

Author Biographies

All three authors are affiliated with the Instructional Psychology and Technology department at Brigham Young University and are instructors for the preservice instructional technology course that is the subject of this article.

Daniel L. Randall is a doctoral student studying online learning in higher education, collaborative innovation, and the use of video and storytelling in instruction. His research is available on Mendeley and his website, http://danrandall.com.

J. Buckley Harrison is pursuing a master's degree and is studying the sense of community and learner satisfaction in blended environments. Other interests include alternative credentialing systems and instructional design theory. His research is available on his website, http://buckharrison.com.

Richard E. West is an assistant professor who teaches courses on instructional technology foundations, creativity and innovation theories, and academic writing and research. He researches how to evaluate and design environments for fostering collaborative innovation, as well as the development of online learning communities and technology integration in secondary

and higher education. His research is available on Mendeley, Academia.edu, and his website, http://richardewest.com.

Abstract

This paper describes the design, development, and implementation of Open badges into a secondary education preservice course on instructional technology. Open badges provide a new way of issuing credentials to individuals who demonstrate knowledge, skill, or ability in a particular domain. Badges provide a simple system for communicating a skill along with specific information about the evidence connected with earning the badge. In this paper, we describe the course in detail along with the several iterations of design that resulted in the development of the badge system, along with the challenges faced and lessons learned for future design and use of Open badges.

Keywords: assessment, badges, credentials, higher education, technology integration, educational technology

Giving Credit Where Credit Is Due:

Designing Open Badges for a Technology Integration Course

With more and more faculty members and universities making their course materials openly available, and with some even offering Massive Open Online Courses (MOOCs), the amount of learning taking place in informal and non-traditional environments has greatly increased. With this increase has come the need to recognize learning outside the traditional educational system. Open badges provide a way to recognize learning from any environment and may hold the key to encouraging lifelong learning through improved motivation and autonomy. In this article, we present our design and implementation of an Open Badge system in a more traditional university course, as well as our efforts to use badges to encourage additional learning after that course has ended and our recommendations for others wishing to adopt a similar type of badge system. As this article is a discussion of the design, and not the research, of a badging system, we also conclude with suggestions for future research.

Physical, Digital, and Open Badges

Youth programs and other organizations both within and outside of traditional schooling have long used badging systems to recognize what a person knows (learning), has done (skills), or has become (role within a community). More recently, digital badges (i.e., digital images used instead of a physical badge) have been implemented for the same purposes within educational communities (e.g., Khan Academy) or social networks (e.g., Foursquare).

The Mozilla Foundation built upon this digital badge movement by creating the open badges Infrastructure for issuing and managing digital badges with embedded metadata. This infrastructure is an open and free credential-issuing platform that acts as a validator between

issuers and earners (The Mozilla Foundation, Peer 2 Peer University, & The MacArthur Foundation, 2012), allowing a badge issuer to easily award badges to an earner who can then store these badges in a digital backpack. Mozilla (n.d.) explained that "the web and other new learning spaces provide exciting ways to gain skills and experience . . . Badges provide a way for learners to get recognition for these skills, and display them to potential employers, schools, colleagues and their community" (Mozilla, n.d.).

More recently there has been a push to distinguish Mozilla Open Badges from traditional digital badges. Since digital badges are nothing more than an image that is shared digitally, they do not offer the security or the assurances that the earner truly deserves the badge. Mozilla's Open Badges provide a digital image but also include metadata that details the issuer's information, criteria for earning the badge, and, if desired, a URL to provide evidence of the earner's mastery. This metadata is sent with the digital image as well as stored on the issuer's servers. In this way the Open Badges Infrastructure provides a level of security and reliability that common digital badges do not (Brandon, 2013).

Open Badges as Promoters of Self-Regulated Learning, Motivation, and Autonomy

Part of the appeal of open badges (hereafter referred to as "badges") is their potential to increase student autonomy and self-regulation, which has been shown to be one of the best predictors of student performance (Pintrich & De Groot, 1990). Self-regulated learning theory recognizes the important role that students play as active participants in their own learning by how they "plan, set goals, organize, self-monitor, and self-evaluate" (Zimmerman, 1990, p. 4). A badging system can potentially support self-regulated learning by offering very specific and attainable goals as badges. In addition, a badge system can offer multiple choices of badges for students to complete, giving the student greater choice and autonomy. Instead of expecting

students to complete an entire course in the same sequence and by completing the exact same requirements as all their peers, students might be allowed to choose badges that are interesting to them within the discipline. This autonomy involves students as active participants in their own learning and can be very motivating to students (Goligoski, 2012).

As students earn badges, they receive feedback on their learning progress, which can in turn confirm their abilities to reach their goals. In contrast with a typical course that gives the student no credential until all assignments are complete, badges give the students recognition for each milestone. Theoretically, this can lead to improved student self-efficacy in their own learning. As Shunck (1990) explained, "When students perceive satisfactory goal progress, they feel capable of improving their skills; goal attainment, coupled with high self-efficacy, leads students to set new challenging goals" (p. 71). As of yet, badges are too new to have been researched, but theoretical constructs such as self-regulated learning, student autonomy, and student intrinsic motivation would suggest that the additional choices and performance feedback offered by a badging system would potentially provide great benefits.

Open Badges as Disruptive Innovations

In addition to the effect on students, badges could be seen as societal disruptors, in accordance with theories on disruptive innovations. Christensen, Horn, and Johnson (2011) have explained that sustaining innovations are innovations that do not create new markets, but rather offer better value in existing markets. Disruptive innovations, however, create their own markets by competing with non-consumption. The key characteristic of a disruptive innovation is that it typically involves lower quality products that are cheaper to produce than their counterparts. Since the quality of these disruptive innovations is generally lower when first introduced into the market, they are not used by the traditional consumers of that market. However, since it is

produced at a much lower cost than its competition, the product is able to satisfy the need of an untapped market that was not currently being served by the more established and costly products.

Currently, the evidence for learning in the educational system is course grades and diplomas. Other programs such as certifications have made some competitive headway but have not altered the main educational model. Mozilla's Open Badges project is decidedly marketed towards the non-consumption areas of education. For example, badges reward the informal acquisition of skills and achievements that are not being recognized in today's formal educational system. This also includes recognition on a micro level, with specific skills and achievements within a topic to provide a more refined picture of the learning that took place. Since the open badges project is free to utilize, the technical cost of issuing a badge is only the price paid for coding an issuing system to utilize the Open Badges API, or essentially zero, as many issuing platforms have already been developed and can be implemented free of charge. This makes badges a textbook example of a disruptive innovation according to Christensen et al. (2011), as badges are cheap to produce and are available to a segment of the education market not currently being served.

When referencing the relatively low cost of producing badges, it is important to note that other costs will most likely be involved (e.g., in the creation of assessments and time spent evaluating the quality of the work qualifying for a badge), but these costs are at the discretion of the issuer. Thus, the main cost of issuing a badge will come from the creation and delivery of instruction and assessment. However, since badges are open to the public, organizations and individuals are able to greatly reduce any administrative costs and directly accredit learning as they wish and are able to, making it a scalable innovation.

Current Status of the Badges Movement

Mozilla is currently maintaining an open wiki where badge issuers can add their organization (wiki.mozilla.org/Badges/Issuers). As of this writing, the wiki displays 36 organizations issuing badges, with many other organizations in the process of designing badges. We will highlight only two of the more influential badge issuers: Purdue University and Mozilla.

Passport

Purdue University has recently launched a beta version of a learning system built around badge microcredentials called Passport (purdue.edu/studio/passport). Passport includes an issuing platform that teachers can use to create and award badges. It also allows students to display the badges they have earned. Passport has the ability for learners to share open badges earned through a mobile device. During the beta release, educators are able to apply for a test account that will allow them to use the learning system to upload their instructional content and assessments and then issue badges to their students for successful completion.

Mozilla Webmaker

Mozilla Webmaker (webmaker.org) is a site dedicated to helping people learn simple web programming. As users learn different concepts they are automatically awarded badges. When we developed our badge system, we were influenced by a system conceptualized by Mozilla that was a cumulative system in which badge "constellations" would be formed (see Figures 1 and 2). A user could earn lower level badges that when grouped together formed a higher-level badge. Mozilla's plan also included badges for skills, achievement, participation, and contributions. These different categories of badges became an important concept influencing our own badges system.

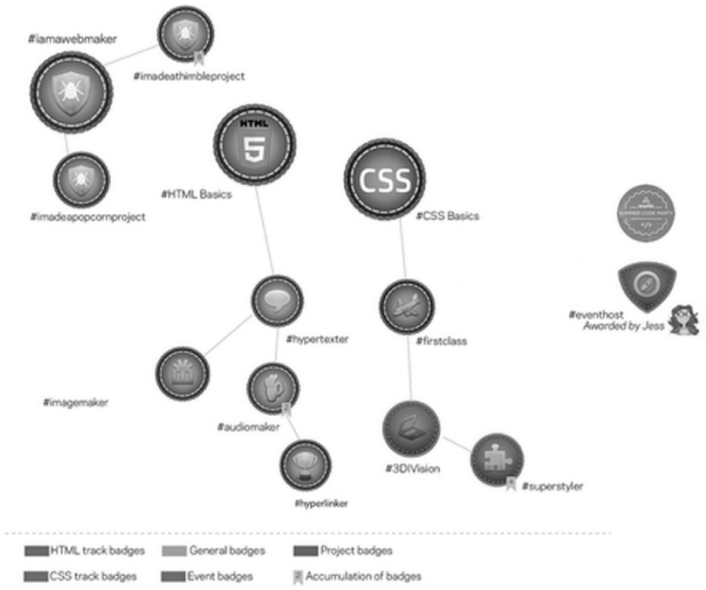

Figure 1. Some of Mozilla's proposed badge constellations. Accessed on December 26, 2012 from http://erinknight.com/post/29830945702/webmaker-badges.

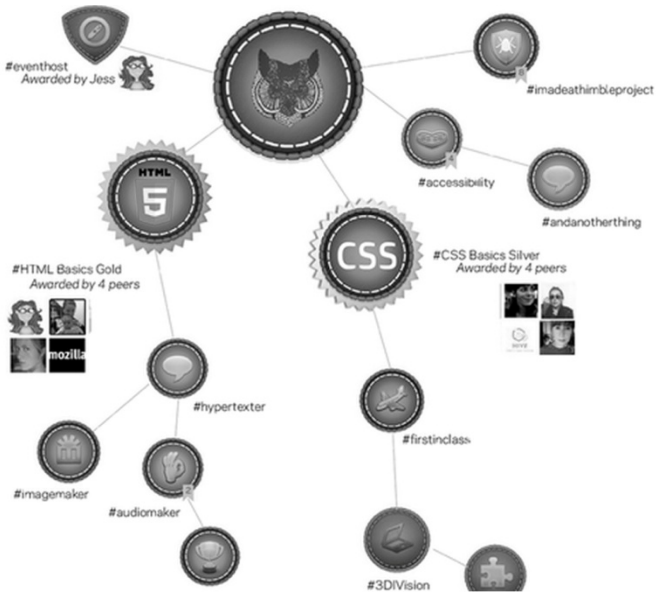

Figure 2. How some of Mozilla's proposed badge constellations would be culminated. Accessed on December 26, 2012 from http://erinknight.com/post/29830945702/webmaker-badges.

Course Description

In order to understand the logic behind the design of the badges, we first need to explain how the course that implemented badges is organized. The course (IPT 286) strives to teach secondary education majors technological skills, knowledge of how to learn new technologies, and the confidence to be able to do so. The biggest challenges of the course are that it is only one credit (whereas similar courses at other universities are typically three), and it services students of all education majors, making it difficult to teach TPACK (Technological Pedagogical Content Knowledge, see Koehler & Mishra, 2009; Mishra & Koehler, 2006) that are specific to each content area.

In our efforts to best accomplish the goals of the course in the time allotted us, we previously organized the course based on three major projects and a few smaller assignments. Each major project involved exposure to multiple technologies and teaching strategies centered on a particular theme, along with the opportunity to create a project using one particular tool. Two of the major projects, the Internet Communications Project and the Multimedia Project, each had a short list of technologies from which students could choose one to learn. For instance, to meet the requirements of the Internet Communications Project, most students created websites using Google Sites. Students who already knew Google Sites instead choose a different technology such as Blogger, WordPress, Ning/Edmodo, or even Dreamweaver.

The third major project, the Personal Technology Project (PTP), asked students to learn technologies they felt would be particularly helpful to them, either because of their content area or personal desire. The project's 15 points could be earned by either completing three less intensive technologies (e.g., Prezi, Poll Everywhere, or Jing) for 5 points each or a more intensive technology for the full 15 points (e.g., Google Earth, Diigo, or podcasting). In between

these larger projects, we interspersed shorter assignments related to Internet safety, mobile learning, and copyright/creative commons. We used a mastery approach in all projects so that students were encouraged to make changes to their project, based on feedback from the instructor, and then resubmit—a process they could complete multiple times.

Implementing Badges to Overcome Challenges and Increase Opportunities

As we mentioned above, our course faced several challenges that we hoped to overcome in order to better serve our students. We felt that badges offered the best solution to many of these challenges and provided additional opportunities.

One-Credit Course

In recent years the options for educational technologies, as well as theoretical understanding about how to integrate technology into education effectively, has been expanding at an impressive rate. To cover this additional material, we sought for a way to extend our course's reach without overburdening the students in a one-credit course. Our hope was that by developing a badge hierarchy that involved various levels of mastery, we could motivate students to continue learning both the technologies taught in class as well as new technologies they become interested in after the class ended. Thus, we developed our badge system to be hierarchical. In class, we now teach the Educational Technology Level of badges (which itself is composed of three levels as shown in Figure 3), where students can receive badges for each technology they master. After completing the class, students can choose to complete new badge levels focused on the planning and actual use/integration of the technology into the classroom. This is further discussed below. In order to better facilitate our students pursuing additional badges during and after the course has ended, we have gathered all tutorials we use in the course into one location directly linked with our badge rubrics (see http://iptedtec.org).

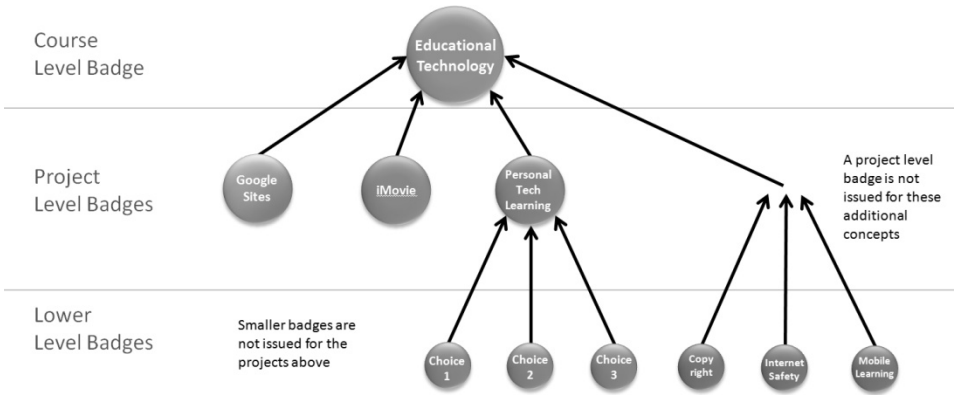

Figure 3. The badge system developed for 286. The lower-level badges are less intensive than the project-level badges. If students earn all the project-level and lower-level badges, they are automatically awarded the Educational Technology badge.

Multiple Instructors and Sections

Another challenge we faced was that 286 was taught in six separate sections, with typically three to five instructors covering these sections. As instructors taught their sections, they individually created tutorials, rubrics, assignments, and class schedules. Though this flexibility allowed our instructors autonomy in their teaching, it created a challenge when we began designing our badge hierarchy. We quickly found that assignments and rubrics needed to be standardized and consolidated into one location in order for our badges to have consistency and rigor. Though the instructors now have less flexibility in their schedules, assignments, and rubrics, they were still heavily involved in the assignment-creation process. Standardization also provided the instructors the benefit of additional time to work with students.

Students with Varying Abilities

Our course is required for most preservice majors at our university, and so we service students with a wide range of technical abilities and backgrounds. The traditional class lecture or workshop format left some technologically proficient students bored and unengaged while less proficient students were lost and frustrated. Because of these challenges, we chose to create a

blended model for the course prior to creating the badges, allowing some students to more efficiently learn on their own and freeing up class time for individual assistance with those who were struggling.

However, a blended course provided its own issues. Since students lacked face-to-face time with the instructor, some struggled to self-regulate their learning and fell behind. Instructors of the course also felt that students sometimes only accomplished the minimum requirements without pushing their skills further. Implementing a badge hierarchy in the course was partially an attempt to motivate deeper study by providing incentives for first doing a better job on each assignment (as a badge would only be awarded for exceptional work) and also to motivate students to continue learning additional technologies. Creating the badges gave us the opportunity to expand our technology catalog by creating tutorials, rubrics, and badges for many more technologies. As a result, students now have more options with which to personalize their learning. They also have the opportunity to learn additional technologies (and earn the accompanying badges) beyond what is required of them in the course, which some have chosen to do.

Showcasing Skills Learned

We recognized that a course number does little to explain the actual skill set of a student to a job provider. With the badges, we wanted to help our students improve their abilities to showcase skills to employers. The badge system enables this by linking the evidence for the learned skill, along with the rubric for what was expected, together with the actual badge, making it easier for students to communicate to others what skills they have.

Design of the ED TEC Badges

While there could be many other ways of designing a badging system, in an effort to provide at least one blueprint for others, the following are the steps we took in designing our ED TEC badges.

We wanted to create badges for as many technologies as possible, so students could personalize their learning experience to their own needs. Thus, we first began by listing major technology options for each assignment. Second, we realized that students and even instructors might be intimidated by the long list of potential technology badges and become confused about which technologies would fulfill class requirements. We decided to graphically organize and group the various technologies together to help students as well as employers understand the relationship between the badges (see Figure 3). We searched for a framework to base our badging system on and settled on the Mozilla badge constellation concept that proposed badges at multiple levels. We modified Mozilla's constellation design to set up a system that allowed students to earn progressively higher badges. As a result, we came up with three different levels for badges (see Figure 3). The lowest level consisted of badges with a small scope; the second tier of badges represented mastery of larger technologies and corresponded to major projects in the course; and the third badge level represented course-level mastery of all technologies and concepts taught in the course and certified a student as being capable of using educational technologies effectively. This upper level badge would be automatically awarded if all of the project-level badges were earned.

Third, we identified which badges needed to be made first in order to have a minimal viable product that would match the assignments taught in the 286 course. As part of this process, we listed all criteria/functions a student would have to be able to do to show basic

mastery of a technology. These criteria formed the basis of the rubric for each badge. We then developed a process, along with accompanying tutorials, for future instructors and teaching assistants to create and vet additional badges so they could be added to our system as they became available.

The most difficult aspect of this badge design was accommodating the Personal Technology Project assignment, which allowed students to learn a wide variety of technologies, some being simple and others much more advanced. We finally decided that larger technologies would be their own badge, but that smaller technologies could be grouped into meaningful clusters. For example, a Social Networking cluster could consist of any number of technologies we felt were needed in order to master that grouping (in this case, perhaps 3-4 social networking technologies such as Twitter, LinkedIn, Facebook, and Google+). Another example would be an RSS badge consisting of smaller projects involving a demonstration of understanding of the RSS concept and ability to use news aggregators, podcast aggregators, and video subscription services.

Fourth, after realizing that we wanted our students to understand and be able to learn technology integration skills beyond just what buttons to push on a program, we conceptualized additional badges focused on the planning and actual implementation of technology into teaching. Here again, we borrowed from Mozilla, this time their idea of having different *types* of badges (skills, participation, and achievement). Instead of Mozilla's categories, we created our own categories to represent a progression from learning TK (technological knowledge) and TCK (technological content knowledge) in our course to our eventual goal of students acquiring TPACK in practice. These additional badge levels would necessarily need to be earned after the

class ended but could perhaps represent professional development opportunities for inservice teachers.

The additional levels of badges beyond 286 (see Figure 4) provide a way for teachers to learn how to successfully integrate into actual teaching experiences the technologies they have previously learned in our class. The strategy-level badge is awarded once teachers prepare appropriate lesson plans or some other strategy needed to implement a technology they have mastered into their teaching. The applied-level badge is earned by showing evidence of successful implementation of the plan in their actual teaching. Finally, when all of the applied level badges are earned, along with the educational technology badge, the Technology Integration Badge is automatically awarded. While these badges are still in development, we believe they will provide teachers with a path to true technology integration.

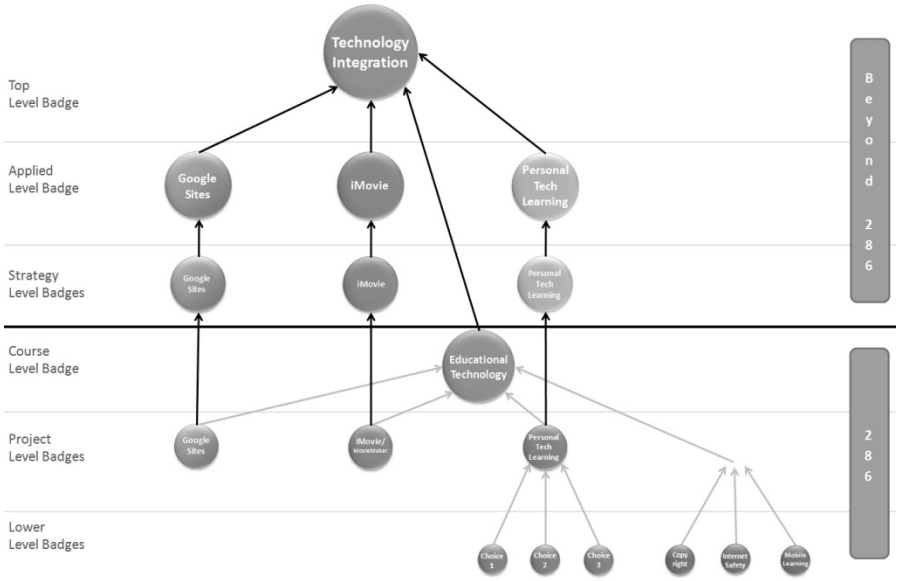

Figure 4. The badge hierarchy extended beyond 286. Badges earned in 286 are considered educational technology badges, while badges that go beyond 286 are meant to help learners develop strategies to implement the technologies learned in 286.

Fifth, we created the branding and stylistic elements of the badges, along with the website to house the badges, rubrics, and tutorials so that all the resources necessary for earning a badge were consolidated (see http://iptedtec.org, see also Figure 5).

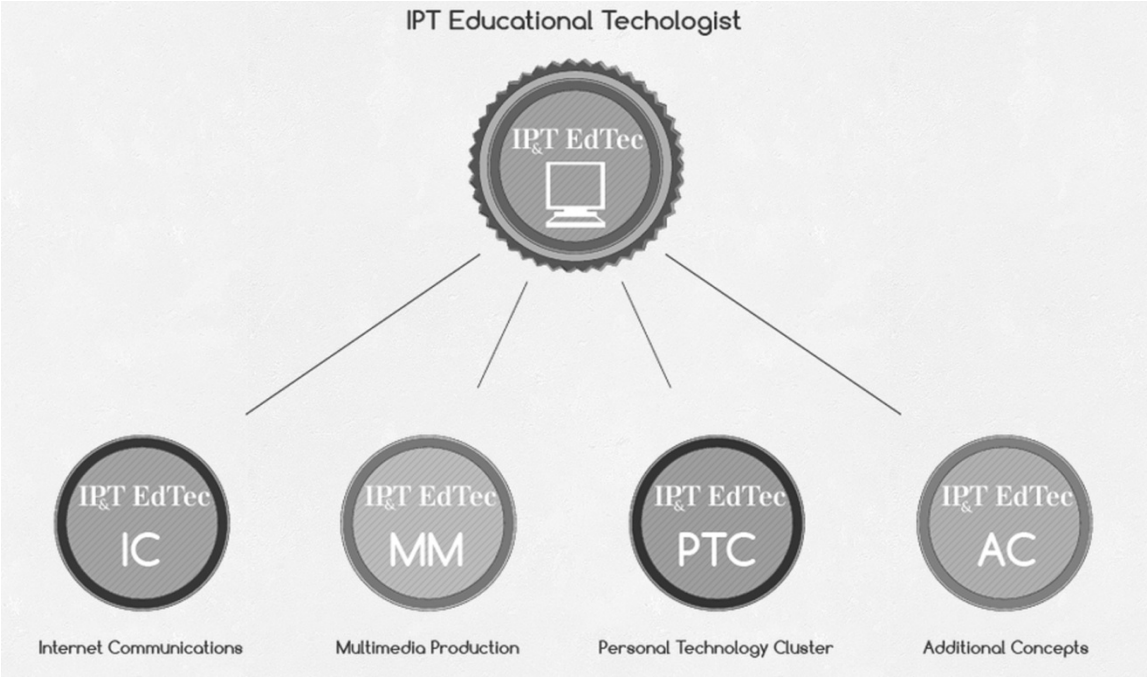

Figure 5. A screenshot showing how the badge system is represented on the 286 website. Each badge on the lower portion of the image represents a major project (except for "additional concepts" which represent three small assignments) and are arranged left to right in the chronological order they are assigned in the course. Users can click a badge to see what technologies they can learn to earn a badge in that category.

Since the design of the site needed to be robust yet maintainable, we chose to use a WordPress site. One advantage of using WordPress is that there are a number of Open Badge related plugins available. To issue badges we used the Badge-It-Gadget-Lite plugin as it worked best with our WordPress theme. WPBadger Display will allow students to display the badges they receive from our course on their WordPress sites. Also, badgewidgethack.org is an option

we taught our students for displaying their badges on the web, although it is not compatible with Google Sites.

Future Design Implications

While we are satisfied with our badge system, there are problems that could arise in the future. One major concern is the financial sustainability of our system. Our current design requires an expert (instructor or teaching assistant) to grade projects based on a rubric, instead of projects being automatically graded by a computer or peers. We believe this is a strength of our model in that it has perhaps a higher level of quality control, but if the number of non-university students desiring badges increases dramatically, we will need to hire more experts to grade. One possible solution would be to charge an assessment fee for non-matriculated students and hire additional teaching assistants who have previously earned badges and demonstrated exceptional skill (perhaps because they have also earned the higher-level badges, showing mastery in the classroom) to assist with assessing projects and providing feedback. This kind of approach could represent a new vision of higher education, where support materials are free, and students pay, when they wish to, for the faculty or TA mentoring, feedback, and assessment.

Thus far the badges we have created are based on skills only, making assessment easier because we can easily determine if a person has mastery of a technology based on the product they produce. But not all learning is based on skills. How could we award badges for conceptual achievements, such as gaining knowledge, understanding, or new attitudes? Even more difficult would be how we could award badges for higher-order thinking such as the ability to be creative, think critically, or evaluate effectively. In a sense, this is not a badges problem but an assessment problem, as assessments of these higher types of learning are often more costly, which might exacerbate the financial challenge raised above.

Maintaining a consistent level of quality expectation across all instructors and TAs awarding badges remains a pervasive issue, especially for us, as there are new students assisting in teaching 286 each semester. Having a well-defined rubric is helpful, as is providing training for graders. However, quality could also diminish if care is not taken when creating rubrics for new badges. Maintaining the credibility of the brand will always remain an issue.

One beneficial feature of open badges is the ability to set an expiration date for a badge, requiring the owner of the badge to recertify after a set amount of time. However, since the badges we would be issuing are for mastery of a specific technology, and technologies change rapidly, deciding for how long the badge would be valid was particularly tricky. For example, iMovie typically only has minor updates each year, and thus someone's skills with iMovie usually would still be current. However, when Apple completely redesigned the program for iMovie 08, the program changed so dramatically that previous skills would need to be updated. Another issue, even for technologies that do not change dramatically, that could allow for longer expiration dates on the badges is that previously learned skills could be forgotten. However, making the badge expire after a shorter time would likely make people less inclined to try and earn it. Weighing all of these issues in the balance, we chose to make our badges expire after 10 years. We felt that in this time, significant changes to a technology would likely have occurred, and if skills had not been practiced, individuals would probably be unfamiliar enough with the technology that they should relearn and thus recertify.

Finally, as open badges mature, we hope for a free, open issuing platform that supports bulk issuing of multiple types of badges to multiple people. The end product would email each student one link to collect all their badges for the course.

Future Research Implications

With open badges being such a new innovation and the implementation of badges in 286 being so recent, further research is needed to understand their impact. Research on institutional issues, like how to fund, support, and manage badges, will likely be needed before badges will be widely adopted. Also, research is needed to determine whether badges provide students with additional motivation as we hoped. Another need is to determine what employers' perceptions of badges are and whether badges positively benefit applicants. An issue of particular concern to us is if the badges have improved the pedagogy of 286. The 286 instructors feel that they are able to more fully meet the needs of students and that the process of creating badges has helped us develop better learning materials and teaching strategies, but a formal study is needed.

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Article #2: Scaling an Open Badge System with Undergraduate Instructional Design Assistants

Scaling an Open Badge System with Undergraduate Instructional Design Assistants

Daniel L. Randall – dan.randall26@gmail.com
Tadd Farmer
Richard E. West
Brigham Young University

Author Biographies

All authors are affiliated with the Instructional Psychology and Technology department at Brigham Young University and are associated with the preservice instructional technology course that is the subject of this article.

Daniel L. Randall is a doctoral student studying online learning in higher education, collaborative innovation, and the use of video and storytelling in instruction. His research is available on Mendeley and his website, http://danrandall.com.

Tadd Farmer earned a master's degree at Brigham Young University and is currently pursuing a Ph.D. at Purdue University. He is interested in online K–12 education, online teacher preparation, and microcredentialing in teacher training and development.

Richard E. West is an associate professor teaching courses on instructional technology foundations, creativity and innovation theories, and academic writing and research. He researches how to evaluate and design environments for fostering collaborative innovation, as well as the development of online learning communities and technology integration in secondary and higher education. His research is available on Academia.edu and at http://richardewest.com

Abstract

In this article, we examined how undergraduate instructional design assistants (IDAs) could be used to affordably scale our open badge system. We had external reviewers rate the badge rubrics created by IDAs and those created by instructors and compared the results. We also conducted interviews with seven IDAs and coded the interviews using a cross-case thematic analysis. We found that IDAs can make badge rubrics that are on par with those created by instructors and that employing them allowed us to create far more badges than we could without their help. We also found that the experience provided many benefits to the IDAs, such as increased technology skills and professional growth. We also provide several practitioner tips for those wanting to employ IDAs.

Keywords: digital badges, credentials, higher education, technology integration, educational technology, teaching assistants

Using Undergraduates as Instructional Design Assistants to Scale an Open Badge System

Over the years there have been many educational technology innovations, yet a surprising number fail (Coleman, 2014). Matt and Fernandez (2013) explained that in the 1920s and 1930s, several prominent universities began offering college courses via radio. At that time, some people claimed that radio would change the way we educate and even eliminate the lecture hall, but by 1941 there was only one remaining radio course that offered credit, and no one chose to enroll in it. Matt and Fernandez (2013) suggested the possible reasons why radio instruction floundered included low completion rates, distractions at home, and lack of social interaction.

Like radio instruction, Massive Open Online Courses (MOOCs) began with similar hype. MOOCs appeared to be infinitely scalable, and many thought they would democratize education (for example, see Portmess, 2013; Skiba, 2013) and possibly disrupt higher education (Horn & Christensen, 2013). However, the hype around MOOCs did not last long. Enrollments in MOOCs were high, but so were the attrition rates (Breslow et al., 2013; Jordan, 2014). Additionally, many scholars claimed MOOCs often used poor, or less effective, pedagogical practices, and questioned how much students learned (Prensky, 2013; Saba, 2013; Siemens, 2014). By 2015, after poor performance (for example, see Kolowich, 2013), MOOCs were not dead, but the hype was (Hill, 2015), and even some leaders in the MOOC space seemed to question their usefulness in higher education (Chafkin, 2013). Radio instruction and MOOCs appear to have followed the path of many previous technological innovations for education. As Cuban (2001) famously declared about computers, they "have been oversold and underused, at least for now" (p. 179).

Recently, a new educational technology innovation, open badges, has been hailed as a potential "game changer for higher education" (Moore, 2013, p.75). Open badges are

microcredentials that represent skills and knowledge acquired within traditional institutions or through more informal and dynamic ways, such as internships, independent learning, and other learning experiences. The affordances of open badges include

1. access to information about the criteria, evidence, and performance required to earn the credential,
2. the freedom to share the credential openly through social media and electronic portfolios,
3. the low cost for hosting and issuing badges, and
4. the independent verifiability to prevent forgery.

These affordances make open badges a potentially disruptive innovation that can service new educational markets outside of and across formal higher education institutions (Randall, Harrison, & West, 2013).

While the concept of open badges is "rapidly gaining traction among educational practitioners, education-oriented companies, and nonprofit organizations" (Devedžić & Jovanović, 2015, p. 603) and is often popular with learners (Cross, Whitelock, & Galley, 2014), badges face similar threats to permanence as the innovations previously mentioned. As Cuban (2001) warned, often the problem seems to come not in the design of the technology innovation, but in scaling its adoption and implementation in a way that achieves positive impact on learners and educational systems. With radio courses and MOOCs, the on-campus course that was the basis for the radio course or MOOC was likely effective, but the method used to scale the course (via radio or MOOC) introduced problems that prevented it from being successful. For open badges to be successful, the institutions implementing badges must finds ways to scale them without sacrificing quality pedagogical practices, so they can make a greater impact.

Educational innovations that can scale, especially with a lower cost than other alternatives, can be very beneficial to people who are underserved, either because of a lack of space or lack of funding, by providing them with greater access to education (Selingo, 2013). In this article, we report on our efforts to improve the scalability of open badges using skilled undergraduate instructional design assistants.

Scaling Badge Systems

We use open badges as part of a larger badge system that services undergraduate preservice teachers in multiple fields. Each badge, which typically corresponds to a single technology, is earned by mastering a number of competencies listed in a rubric. For this reason, in our system we use the word "badge" generically to include not just the digital credential, but also the corresponding rubric, and any instructional aids. Our badge system is used in conjunction with a course, IPT 286, in which students are required to complete three educational technology projects. Students complete these projects by choosing to do one of several badges options. For example, the Internet Communications Project can be satisfied by completing the Google Sites badge, the Wix Badge, or another badge in that category. This allows students greater choice and autonomy, while simultaneously reducing the demands on instructors' time so they can provide individual instruction to students who need help (Randall et al., 2013). We desired to scale our badging system to service more people, with more options. We believe the current challenges to scaling badge systems, such as ours, includes maintaining rigor and quality control while assessing submissions and creating new badges (West & Randall, 2016).

Assessment

The assessment process should involve more than a simple review of a learner submission to determine whether or not a badge should be issued. Instead, the process should

provide learners with specific, formative feedback that allows them to reach mastery. This is not only important for learning, but also gives the badge more credibility as a legitimate credential (West & Randall, 2016). However, providing quality feedback based on a rigorous assessment process can be time intensive. This is especially true as many skills are best assessed through human graders, which can make scaling while maintaining quality in a badging system difficult.

Badge Creation

Maintaining quality in a badging system requires ensuring that new badges are developed according to the core philosophy of the badging entity and that all elements associated with the badge, such as the rubric and instructional materials, are completed. Completing all steps in the process and maintaining rigor throughout can be time-consuming and a challenge to scalability. In addition, in some badging systems, such as ours, there are additional challenges related to having sufficient content knowledge in the areas represented in the badges. A lack of content knowledge within a badge development team can slow down the process and reduce the quality of the badges produced.

Undergraduates TAs as a Potential Solution

Undergraduate teaching assistants (TAs) may be one solution to some of these challenges as they can be more affordable. While TAs often perform more clerical functions and have generally less responsibility than graduate teaching assistants (Weidert, Wendorf, Gurung, & Filz, 2012), TAs who have been given more responsibilities have demonstrated an ability to perform these tasks well (Mendenhall & Burr, 1983; Weidert et al., 2012). Such tasks include reviewing assignments and tests and making suggestions for improvement, writing some test items, and performing other similar functions (Hogan, Norcross, Cannon, & Karpiak, 2007; McKeegan, 1998; Mendenhall & Burr, 1983). Indeed, Mendenhall and Burr (1983) advocated

for giving TAs more responsibilities, noting that in cases in which this had been done, the TAs were able to meet the expectations.

For TAs to be effective, they must be well trained. Several institutions who utilized TAs provided extensive training in the form of orientation seminars, weekly meetings, and personal mentoring (Hogan et al., 2007; McKeegan, 1998; Mendenhall & Burr, 1983; Weidert et al., 2012). While TAs are given a great deal of training and responsibility, they are frequently instructed to contact the instructor of the course for guidance when needed (Mendenhall & Burr, 1983).

Undergraduates as Designers

One example of giving undergraduates more responsibilities was reported by Johnson (2014). While universities often hire a team of instructional designers to implement a new learning management system (LMS), Johnson's university hired, on a part-time basis, 55 undergraduates who served as implementation assistants (IAs). They helped train faculty on the new LMS, assisted faculty in migrating their course and even rebuilt courses in the new LMS. Approximately 1,242 faculty and staff members received one-on-one training from IAs. IAs logged nearly 11,000 phone calls and over 6,000 emails to accomplish their work, a staggering number that could have only been achieved by a large group of employees. These numbers provide evidence that a large group of well-trained and qualified undergraduates can effectively perform many professional tasks. It may even be more cost effective, as Johnson (2014) noted "because we were able to hire as many students as we did, we were able to support more faculty members than we could have had we hired more [full-time instructional design] consultants" (p. 84).

For many IAs, this was their first professional job, and they received extensive training once they were hired. Johnson believed that "even though they are not trained pedagogues, student employees can be taught principles of effective course design and can teach these to faculty members, who will listen" (p. 87). Many faculty members asked these IAs questions about pedagogy and accepted suggestions from IAs about how to improve the design of their course.

Undergraduates as Assessors

Besides being effective designers, research suggests that undergraduates can potentially be taught to assess specific performances at a similar level to experts in relatively little time. Prusak, Dye, Graham, and Graser (2010) examined undergraduate students' ability to accurately and reliably code videos of people performing a skill. Students were trained on the competencies they would assess. After only two hours of training and three practice attempts, students were moderately reliable and highly accurate when compared to expert reviewers. The authors noted "it seems evident, from the results of this study that students can become capable analyzers" (p. 151).

While studies such as Johnson (2014) and Prusak et al. (2010) showed that undergraduates can often perform well in design and assessment tasks, the research in this area is thin, and additional studies are needed. In particular, research is needed in how undergraduates might help in successfully scaling a potentially disruptive innovation, such as open badges, by serving simultaneously as assistants in the design and in the assessment process.

Description of Research Context

To support our open badge initiative, we followed a similar practice as described by Johnson (2014) and hired many undergraduates, an average of 2–3 per year, to assist us in our

badge creation, assessment, and maintenance. Some worked as teaching assistants (TAs) who helped assess submitted projects, while others were instructional design assistants (IDAs) who helped design and test new badges. In some instances, undergraduates worked simultaneously as both TAs and IDAs.

TAs performed much of the grading required by our assessment model. To ensure quality grading and feedback was given, TAs received group instruction and one-on-one mentoring. Course instructors periodically spot-checked grading done by TAs and, if needed, provided additional mentoring or instruction. Our detailed badge rubrics, along with grading guides and other job aids, also aided TAs. By using a group of TAs that had been specially trained, we were able to grade far more submissions with a relatively low cost.

The challenges we faced in creating more badges were identifying the needs of the content areas and developing badge rubrics for content-specific technologies without specialized disciplinary knowledge. To meet these challenges, we hired undergraduate teaching majors specializing in the subjects we lacked sufficient knowledge of. Working with instructors who were experienced badge designers, these IDAs were able to identify and create rubrics for discipline-specific and general-use technologies. IDAs also created student examples and other instructional materials.

Research Questions

We believe that employing IDAs and TAs allowed us to effectively scale our badge system, while also benefitting IDAs and TAs by providing them with valuable experiences that could that positively affect their careers. In this study, we sought to validate these beliefs. While employing undergraduate TAs to grade learner submissions is not unprecedented, the use of IDAs is rarer in research and practice. For this reason, we chose to focus our examination of the

effectiveness and experiences of the IDAs. Specifically, we sought answers to the following research questions:

1. How effective were IDAs in creating quality assessment rubrics, and quality, well-aligned content?
2. What were the experiences IDAs had while creating these materials and how could IDAs' experiences be improved (e.g., what worked well, what could be better, and was the overall experience useful to them?).

Methods

To determine the quality of the badge rubrics created by IDAs (research question 1), three external badge designers familiar with our badge system were asked to rate 11 of our badge rubrics, four made by instructors with experience designing badges and three made by IDAs. Reviewers were unaware some rubrics were made by IDAs. Rubrics were given a score of one to four, four being the highest, for the following criteria (see Appendix A for the full rubric):

- Spelling and Grammar
- Demonstrable Tasks
- Rigor/Comprehensiveness
- Clarity
- Adoptability

Seven rubrics reviewed were for *large* projects and four were for *small* projects (rubrics for larger assignments of 6–8 hours vs. small projects of 1–3 hours). The ratings were compared to determine if there was a difference between the rubrics made by instructors and those prepared by the IDAs.

To examine IDAs' experiences (research question 2), semi-structured interviews were conducted with seven IDAs. These interviews provided information about what they did as an IDA, explored how they believed they benefited by being employed in this fashion, and what changes could be made to improve their experience in these positions. We considered each IDA as a separate case and wrote short vignettes describing their experiences. A cross-case thematic analysis was used to determine common themes in their experiences. Codes were based on questions used in the interview (see Appendix B), which can be grouped into the following categories:

- technology skills (improved or unimproved)
- subject matter knowledge (improved or unimproved)
- perspective (changed or unchanged after being an IDA compared to being a student in IPT 286)
- job duties (positive and negative)
- project contributions (positive and negative)
- how subject matter expertise helped them perform their job
- professional growth
- attitudes regarding badges (positive and negative)

Constant comparison analysis techniques (Glaser & Strauss, 1967) were used to allow additional categories to emerge. Two researchers coded all the interviews. They first coded the same interview separately and then met to compare categories and discuss discrepancies to improve trustworthiness of the categories. They then coded a second interview separately and met again to discuss it to further strengthen the integrity of their coding, after which they coded the rest of the interviews. When they found passages that they did not know how to code they worked

together to determine what code should be used. Finally, member checking was used to ensure we correctly interpreted the interviewees' responses.

IDAs' Experiences

Our IDAs were all former IPT 286 students who had received high grades in the class and had extensive knowledge in their field compared to most undergraduates. Four IDAs had completed (or nearly completed) the content courses for their major. At least four were former research assistants, two were double majors, and several had teaching experience due to having been TAs previously or having worked in other educational positions. Most reported that they felt their technology skills were about average, but that they generally felt they could learn new technologies fairly easily.

There were two different formats in which the IDAs worked. Five IDAs, Hollie, Dena, Janelle, Liz, and Joy, worked within a more collaborative format (although not all at the same time), while Steve and Carter worked within a much more independent format (names have all been changed, except for Janelle who requested we use her real name). Both formats will be described before we detail the aspects of the IDAs' experiences, as the difference appears to have had some effect on their overall experience.

Collaborative Format

While each IDA had individual assignments to design specific badges, Hollie felt creating badges in the collaborative format was "very much a team thing." For instance, IDAs reviewed rubrics made by other IDAs, going through each step as if they were a student in the class. The reviewer then collaborated with the IDA authoring the rubric to resolve the problems found before the rubric went to the instructor for the final review. This process also produced a sample of a completed project that we could put online along with the badge rubric.

IDAs in the collaborative format met each week as a group with the instructor leading the project to report on their progress, receive new assignments, and discuss any challenges they faced. Hollie said these meetings were also a good time to arrive at solutions to particularly challenging problems encountered during the peer-review process. Janelle summed up the collaborative format:

> We worked well together, and it was nice because we could do kind of our own work, and we only had to get together maybe once a week for an hour and just kind of rocket through each of the ones that we had done. And then we would send them off to [the instructor] to do . . . the final approval. So that worked well. If they're not doing that now, then that would definitely be a helpful thing for them.

Independent Format

Steve and Carter, the two IDAs that worked independently, wrote rubrics without the benefits of peer-review and collaboration with other IDAs. Steve said, "I never collaborated with another badge designer on any badge that I was working on. I would create the badge and then get feedback [from an instructor] and maybe tweak it a little bit before sending it out to the students."

Training and Support

While the training and support given to each IDA varied, most IDAs in the collaborative format were mentored by the instructor leading the project while creating their first one or two badges. They also had job aids to help them, such as a guide explaining how to make a badge, and a badge creation template. Additionally, IDAs in the collaborative format participated in the weekly group meeting mentioned previously. Steve and Carter had less interaction with the instructors and received less training and support.

Mentoring and collaboration. Janelle was one of our first IDAs, and since we had not yet developed any training materials, she received extensive one-on-one mentoring. Instead of working elsewhere like most of the later IDAs, Janelle worked in the office with the instructor leading the project and was able to get immediate support if she needed it. She recalled,

> It was helpful that I had a good relationship with [the instructors]. I knew that [making badges] was a new thing, and . . . I knew that I could go to them at any point and say, "I don't understand what you want here."

Joy said for the first couple of rubrics she made, the mentoring instructor would make suggestions and provide additional instruction, but after she became more experienced she required less help. She felt she had support throughout her time as an IDA, as instructors her other IDAs were "always really quick to answer questions that I had."

Although Carter was not in the collaborative format, he too felt like he received adequate training on the badge creation process. He said instructors told him, "if you need help, you can come in and talk [or] sit down with [us]." Steve felt like he was "tossed in there," although he did say he could always go to instructors if he had questions. Steve was an IDA when we were examining new ways of designing badges. Consequently, he rightly felt there needed to be "more clear direction" for what a badge rubric should and should not include.

Prior experience with our badge rubrics. Since all our IDAs had successfully completed the course, they already had some familiarity with our badges rubrics. Liz felt she did not receive much training, however, because she had been "shown some examples of some other badges, and I had taken the class . . . I had an idea of what [the instructor was] looking for." Carter said, "the biggest thing that helped [him]" was the fact that he proofread all of the instructors' badge rubrics before he wrote a rubric himself. This allowed him to "become

familiar with how the rubrics worked" and the "general structure of the rubrics," which "guided [his] process" as he created rubrics. Carter believed it would be "very effective" to train new IDAs using this structure.

Opportunities to grade projects. Liz felt that having the opportunity to grade some projects might have made her better at writing badge rubrics:

> I think I would have liked to have the experience of grading . . . so that I could experience that frustration and be able to see where some of the pitfalls might be when I was writing my rubrics.

In comparison, Janelle had the opportunity to grade numerous projects, some that even used rubrics she created, and mentioned that grading helped her make better rubrics.

Benefit to IDAs: Growth in Technology Skills

Joy said the greatest benefit she received from working as an IDA and a TA was "having a more adventurous attitude about using technology." This sentiment was shared by most of the IDAs. At least six of the seven IDAs expressed feeling more confidence learning and using technology as a result of their IDA experience. Hollie said being an IDA gave her "the majority of [her confidence] . . . 90 percent of it." Carter developed the ability to "approach something that's totally unfamiliar to [him] and [figure] out how to use it to the point where [he knows] it well enough to help somebody else be able to use it." Liz was surprised by "how much [she] could just figure out on [her] own" by exploring a technology.

Several IDAs said being an IDA exposed them to many technologies that they would not have been aware of otherwise. For instance, Dena used biology apps she discovered as an IDA to start an after-school biology club, while Carter became familiar with most of the 50 technologies we had available as badges. And Liz learned much more about LoggerPro while

making badges for it, even though she had already used it many times before as a student. Carter said he now has "the skills and disposition and aptitude and the tendency to just try to stay on top of new innovations."

Finally, both Joy and Janelle mentioned becoming the de facto technology gurus in their schools because of their ability to learn and use technology effectively.

Benefit to IDAs: Other Professional Growth

Besides improved skills and confidence with technology, former IDAs reported additional types of professional growth. Three IDAs (Liz, Carter, and Steve) reported that writing badge rubrics helped them approach learning from a student's' perspective, which allowed them to create better learning materials. Liz said she learned how to relate physics to newcomers that do not have the same background and terminology that she has.

Similarly, two IDAs (Janelle and Steve) mentioned that their time as an IDA helped them write better rubrics. Janelle had created rubrics and other teaching materials before for education classes but had never seen someone actually do the project she developed. As an IDA, she was able to see how students interpreted what she had written and was able to create better rubrics as a result. At least two IDAs (Carter and Joy) specifically mentioned the desire to apply a mastery approach in their own teaching, similar to that used with the badges in Ed Tech 200.

Positive Aspects of IDA Work

All of the IDAs said that being able to help others—by making badges or by working with students as a TA—were among their favorite experiences as an IDA. They also identified a few negative aspects.

Contributing to others' learning brings rewards. All the IDAs felt the badges they designed were well made and would be of benefit to others. Several IDAs said this contribution

was the best part of their experience. Liz said, "knowing that I was able to help another teacher down the line . . . was really the most rewarding part." Similarly, Hollie enjoyed seeing people use her badges and said,

> "I feel like I did do something that contributed to like, teachers learning how to better use technology in their classroom . . . and that was the coolest thing for me . . . I feel like I contributed to . . . the education of the world."

Negative Aspects of IDA Work

Most IDAs reported very few negative aspects of their work as an IDA. Hollie said, "I can't really think of that many negative things," although she admitted that she wished badges could have moved from start to finish faster. Dena did not particularly enjoy making the first badge she created as she did not believe the technology would be very useful to biology teachers. As mentioned before, Steve was sometimes frustrated that there was not more direction about how to create a badge.

Positive and Negative Aspects of Serving as a TA

While we chose not to investigate the TA roles many IDAs also served in, we received so much feedback about that role that we felt it was important to include a few items. For instance, Carter said the opportunity to provide feedback on projects and mentor others was very rewarding to him. For Janelle and Joy, the most rewarding parts of their time as an IDA/TA was working directly with students. Joy loved teaching workshops about various technologies and Janelle particularly liked working with students who needed extra help. Hollie really enjoyed grading student projects because it allowed her to see everyone's "different interpretations" of the requirements.

While few negative aspects of IDA work were reported, those also serving as TAs were able to identify more negative aspects of that role. At one point, we experimented with allowing anyone, not just IPT 286 students, to submit a project. Janelle was tasked with grading the submissions from people outside the course, and said it was her "least favorite part" because it was "less rewarding or less interesting" to her. Also, many outside submissions failed to address several criteria in the rubrics, which unnecessarily created more work for her. The other TAs mentioned challenges that are common to all TAs and teachers. Joy, who only graded submissions from IPT 286 students, said grading was not "the most fun thing" to do because "it tends to be a little bit tedious" but recognized "that's just the nature of grading." Hollie recalled that the hardest thing for her was trying to help students in class with a technology that she was not as familiar with.

Effectiveness of IDAs

Overall, the IDAs appear to have done as well, if not better, than our instructors who were experienced badge designers. Speaking of all the rubrics she reviewed (both those by instructors and those by IDAs), one reviewer noted that most of the problems she found were "grammatical in nature; I thought the content for the badges in general was high quality to begin with!" However, there were some isolated challenges, which are described below. We begin by discussing one rubric that was an outlier before then discussing overall results.

LoggerPro

The greatest discrepancy between the work of the IDAs and the instructors was with the rubric for LoggerPro, a data analysis program used in several fields of science. While LoggerPro is used frequently in those fields, the IPT 286 instructors were unfamiliar with that type of software and how science teachers would use it. The instructors produced a rubric but

acknowledged that the rubric was not rigorous. To address this problem, we hired Liz, a teaching major with a strong science background, to be an IDA. Liz was mentored by an instructor but was ultimately the author of the updated LoggerPro rubric.

We asked the reviewers to rate both the original LoggerPro rubric and the updated version. Every reviewer gave a much higher overall score to the LoggerPro rubric made by the IDA (17/20, 19/20, 15/20, respectively) than the one made by the instructors (15/20, 15/20, and 10/20, respectively). Also, the LoggerPro rubric made by the instructors was rated lower than any other rubric by all three reviewers, respectively. This provides evidence that, at least with content-specific technologies, mentored IDAs can produce a better rubric because of their familiarity with the subject matter and the technology. However, since this is a single case, more studies are needed to see if this observation holds true generally or if this was only true in this specific case.

Average Ratings

To compare the rubric ratings, we looked at the average score of the large rubrics produced by the instructors and compared it to the average of the large rubrics made by IDAs (scores could range from 0-20). We followed this same procedure for the small rubrics. As Table 1 shows, IDAs received a higher average total score for the group of small rubrics and even when the LoggerPro rubric is excluded from the instructors' score, the IDAs scored higher on the large rubrics.

Table 1

Summary of Ratings for Each Group of Rubrics

Instructors or IDA	Large or Small Rubric	Average Total Score
Inst. (excluding Logger Pro)	Large	17.8
IDA	Large	18.1
Inst.	Small	19
IDA	Small	19.2

Comparing the average ratings of IDA-made rubrics to instructor-made rubrics by individual criterion showed there were no consistent cases in which instructors and IDAs outperformed each other (see Table 2). However, if the instructor's LoggerPro rubric is not included, instructors scored slightly higher than IDAs in Demonstrable Tasks and Clarity for both large and small rubrics. Again, if the LoggerPro rubric made by instructors is not considered, both IDAs and instructors had the exact same score for rigor/comprehensiveness when comparing large rubrics to large rubrics and small rubrics small rubrics. Since maintaining rigor was one of our greatest concerns when employing IDAs, this finding is very encouraging.

Table 2

Summary of Ratings for Each Group of Rubrics by Criterion

Group	Spelling & Grammar	Demonstrable Tasks	Rigor/ Comprehensiveness	Clarity	Adoptability
Instructor-Large Without LoggerPro	3.78	3.78	4	3.78	4
Instructor-Large with LoggerPro	3.75	3.5	3.58	3.33	3.67
IDA-Large	3.11	3.56	4	3.67	3.78
Instructor-Small	3.17	4	3.83	4	4
IDA-Small	4	3.67	3.83	3.67	4

IDAs' Thoughts on Badges

Since our IDAs experienced badges first as students and then as badge designers, they had unique perspectives on open badges. In this section, we briefly describe their thoughts on the badging movement.

While some IDAs, such as Liz and Dena, liked the concept of badges as a student and continued to like them, others were not enthusiastic about badges until they became an IDA. Both Hollie and Joy reported that as students they only cared about what was required to complete the assignment and earn their grade. That changed once they became IDAs. Hollie's enthusiasm came when she realized our badge system focused not on the products students create, but on the skills it takes to produce them. Hollie believed many students feel as she once did and hoped they too will have the realization she had.

Several IDAs liked that the badge system provided students with options about what to learn. All the IDAs continued to remain enthusiastic about badges, although some expressed

disappointment that the idea had not spread more widely in the field of education. Three of the former IDAs mentioned they wished they could earn badges for professional development credit and for relicensing credit.

Ironically, none of the IDAs have displayed their badges online or otherwise shared them with prospective employers even though most have now gone through the teacher hiring process. Janelle and Carter said they believed principals would not know what badges were and thus would have little meaning. Liz and Joy, however, felt badges would be useful in showcasing their skills and could increase their chance of receiving a job offer. Unfortunately, neither Liz nor Joy displayed their badges digitally because, as all the IDAs said, they could not find an easy way to do so. Joy listed the technologies she had badges for on her resume but did not provide links to the badges themselves. It seems everyone would like it to be easier to display badges. Liz hoped there will someday be an easier way to display them on LinkedIn.

Practitioner Recommendations

By employing IDAs we were able to greatly increase the number of badges in our badge system while also maintaining quality, since the badge rubrics IDAs created were on par with those created by our instructors and were rated by experienced instructors. IDAs also allowed us to create badges for subject-matter–specific technologies, which we had failed to do effectively. IDAs also benefited from this arrangement as they gained valuable experience and skills that has helped them in their careers and other pursuits. Employing IDAs as we have could prove beneficial to other organizations that are seeking to increase the scale of a project or initiative. We offer the following suggestions to those interested in utilizing IDAs.

Selecting Qualified IDAs

Choosing well-qualified undergraduates to serve as IDAs likely helped us succeed. As previously mentioned, all the IDAs had taken and performed well in the course. Additionally, each demonstrated expertise in their subject matter above what one would expect of a typical undergraduate. Many also had prior experience as a teaching assistant or research assistant that further prepared them for serving as an IDA.

Mentoring

Utilizing a mentoring process to both train and support IDAs appears to have been very effective. Both Janelle and Joy specifically mentioned the mentoring they received as helping them succeed. Building a relationship of trust by explaining what IDAs were doing well and providing suggestions for improvements were important parts of the mentoring process. Mentors making themselves available to sit and work with the IDA, if needed, was also important. Some IDAs chose to work in the same lab as one of our instructors and knew they could approach him at any time with questions. Our instructors were also quick to respond to emails when IDAs needed help, which Joy specifically mentioned was “key” to performing her job successfully. Even IDAs who seemed to have received less mentoring, such as Carter, still felt they could succeed because they knew help was readily available. The weekly meetings during which IDAs met together with the instructors and talked about their individual projects continued the mentoring relationship.

Ownership

Another aspect we believe was important was that IDAs felt ownership over their badges. They were not given a small piece of a project to work on, but were tasked with a full badge project, which gave more meaning to their work. IDAs knew the badges they were creating

would be seen by other people, both undergraduates taking IPT 286 and by people outside the university. As a result, they wanted to do their best. Hollie said that after launching badges she had made, she would see students "working on those badges. I was like a little proud mom."

Peer Collaboration

While IDAs had ownership over their project, they also collaborated by reviewing each other's rubrics and providing feedback. Joy described it this way:

> It was definitely a team effort, like I would learn the technology, create the rubric and then there would be a couple of other people who would vet it and make sure that it was a good rubric. . . . They'd suggest revisions and I'd make them. I definitely felt like there was a team effort involved. . . I had a lot of support because my teammates were always really quick to answer questions that I had.

This process improved the quality of the rubrics and reduced the time the instructors had to spend reviewing rubrics and providing feedback. It also allowed us to support a larger number of IDAs and helped extend the mentoring relationship to IDAs' peers.

Job Aids

While the instructors were available if IDAs needed them, the how-to guide and job aids allowed IDAs to have more autonomy and acted as scaffolding. The how-to guide was especially helpful when IDAs were learning new parts of the process. While the instructors wrote much of the guide—particularly the section on the philosophy behind our badge system—anyone was able to add to the document. Eventually, nearly every aspect of our process was detailed.

A Google spreadsheet acted as the badge creation template in which IDAs wrote drafts of their rubric. The template facilitated the process of reviewing drafts and providing feedback. It

also detailed each step in our design process with a way to mark when a step was completed. This was particularly helpful for task and project management. Before we created this template, it was not uncommon for IDAs and instructors to forget some steps in the process.

Being an IDA and TA

As mentioned previously, some undergraduates were both IDAs and TAs, while others were IDAs only. Those who chose to only be IDAs did so either because they could not take on or did not desire to take on the additional role. However, those who filled both roles seemed to benefit even more from the experience. Hollie expressed how rewarding it was to see the badges she had designed being used by students she was working with in her TA role, but she also said being a TA allowed her to see how she could make improvements to her badge rubrics. Likely, this made her a better designer. Similarly, Liz, who served only as an IDA, wished in hindsight that she'd had the chance to grade a project, as she believed that experience might have improved her rubrics. Janelle said her favorite part of being an IDA/TA was teaching workshops about different technologies to students in IPT 286. Joy also said she greatly enjoyed teaching workshops. We suggest that providing IDAs the opportunity to be both IDAs and TAs, when applicable, might provide a more rewarding experience and could improve their design skills. We hesitate to suggest requiring IDAs serve as TAs because some of our most qualified IDAs would not have been able to join our team had that requirement been in place. The subject matter knowledge those IDAs brought to the team was critical to our success. However, having IDAs also act as TAs bears serious consideration.

Future Research

While we are confident in the ability of well-qualified undergraduates to serve as IDAs, this study was limited to seven IDAs in one program. More studies are needed to better support

our conclusion. Additionally, all our IDAs were preservice teaching majors, most of whom had already completed most of their coursework on pedagogy. It is unclear if IDAs from non-teaching majors would be as successful in the role of an IDA. Similarly, it is unknown if IDAs from non-teaching majors would benefit professionally from being an IDA. A study that looks specifically at IDAs from a wide range of non-teaching majors could answer these questions. Additionally, future studies could examine how the IDA model and open pedagogy (Wiley, 2013) could reinforce one another.

Conclusion

In this study, we examined how using undergraduates as instructional design assistants could allow us to increase the scale of our open badge system by increasing the man-hours on the project at a relatively low cost. We found that with the help of IDAs we were able to greatly increase the number of badges in our system without compromising the quality of the badge rubrics. In fact, IDA and instructor-created badges were generally of the same quality. We also found that employing IDAs not only benefited our project but also provided many benefits to the IDAs. These included improved technology skills and professional growth that has helped them in their careers. We also identified several principles that allowed our IDAs to be successful, including mentoring, giving them ownership of projects, encouraging peer collaboration, and providing them with job aids.

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Appendix A

Rubric Used for Rating Badge Rubrics

	Beginning 1	**Developing 2**	**Accomplished 3**	**Exemplary 4**
Spelling and Grammar	The rubric has 5 or more spelling and grammar errors	The rubric has 3–4 spelling and grammar errors	The rubric has 1–2 spelling and grammar errors	The rubric is free from any spelling or grammar errors
Demonstrable Tasks	The rubric fails to require any evidence from students	The rubric misses major opportunities for evidence collection	The rubric captures major evidence of student learning	The rubric requires evidence of every demonstrable requirement
Rigor/ Comprehensiveness	5 or more missing features	3–4 features not included	The rubric has 1–2 associated features that are not included	All features typically associated with the technology are included in the rubric
Clarity	The rubric is mostly unclear, containing more than 4 unclear requirements	The rubric requirements lack general clarity, and contain 3–4 requirements that are unclear	The rubric requirements are mostly clear, with 1–2 requirements that are unclear	The rubric requirements are clear, concise, and easy to follow
Adoptability	Very unlikely	Somewhat unlikely	Somewhat likely	Very likely

Appendix B

Interview Questions

Background:

- What was your background/experience with technology when you were hired as a TA?
- What was your background/experience in your subject area upon being hired as a TA?
- What else can you share that would give readers an idea of your level of expertise in your field (special programs you have participated in, etc.)?

Experience as a TA for IPT 286:

- How was being a TA in the class different from being a student?
- What was the most difficult part of being a TA?
- What was the most rewarding part?
- How did you personally contribute to the program and the class?
- What badge design and development activities did you enjoy the most? The least?
- Approximately how many badges did you help develop? Tell me about the process you used to develop them.
- What did you learn from that process that you felt was valuable to you?
- How did your subject knowledge help you write rubrics?
- Would it have been more difficult or possible to write the rubrics you did without your subject knowledge?
- Do you think a student going into your field would benefit from earning the badges you designed? Why or why not?
- Do you think others going into your field might benefit from being a badge designer? Why or why not?

Attitudes:

- How did you feel about badges as a student in the class?
- How did you feel about badges as a TA? If your feelings changed, why did they change?
- As a TA, how did you perceive students' attitudes about badges to be?
- Have you displayed your badges? Do you use them in professional settings?

Current teaching situation:

- Where are you teaching currently?
- If student teaching, does the teacher you work with use technology in the classroom?
- Did having technology experience help you get your job? If so, please explain.
- Does having technology expertise help you in your classroom?
- Do you use technologies you learned or taught in IPT 286 in your classroom?
- Did badge design help you learn instructional strategies you have used? How so? Which strategies or skills?
- Has developing badges helped you in other ways in your current teaching role? If so, how?

Appendix C

IDAs' Backgrounds

Steve was a double major. His primary major was social science teaching, with linguistics as a secondary major. He worked previously at BYU as a writing tutor, which gave him some teaching experience, as well as experience giving feedback to students.

Hollie was also a double major, with physical science teaching (which includes physics and geology courses) and chemistry. She had finished all her science classes for her majors and was starting to take teaching classes when she took the blended section of IPT 286. Before being hired as an IDA, she described her technology skills as a "standard college student . . . capable, but not well-versed in a variety of [technologies]."

Carter was majoring in social studies teaching at the time he was an IDA. Previously he had worked as a research assistant for a history educator professor. In that job, he often focused on teaching methods and educational tactics, especially in social studies.

Dena was a biology education major who had finished all her course work, except her student teaching, when she became an IDA. She had also done some substitute teaching. She had also worked at the university's Museum of Life Sciences for two years. In that job, she added plants to the database, mounted specimens, and helped her professor collect data on two new species he found. This background helped her when she created a badge for a leaf identification app. Dena did not have a lot of technology background but described herself as a typical user. For an undergraduate, Dena had a strong background in teaching theories and how they might be used in a classroom. She felt this knowledge helped her as an IDA.

Janelle was an English teaching major close to completing her degree. She had already taken most of her education classes, so she had a little classroom teaching experience by the time she became an IDA. Her English teaching courses also included instruction on creating rubrics,

which was helpful to her. As an English major she also had strong editing skills she was able to use. Before being an IDA, she worked for the statistics department for two years, first as a front desk secretary and later as an administrative assistant. She used basic office programs, as well as InDesign. As for her technology skills, Janelle felt comfortable helping others with programs she had used before, but she also felt confident that she could learn new technologies fairly easily.

Liz was a physics teaching major who had already taken several education classes before she became an IDA. She had also been a teaching assistant for several physics classes at the university. Liz had used LoggerPro before she became a IDA (both in high school and in college), but by the time she became an IDA it had been a while, so she did not remember everything about it. However, her early experiences with LoggerPro helped her develop ideas of what to include in the badge. Liz has "always felt like [she] was good with technology" and if she does not know how to do something she can figure it out.

Joy earned a bachelor's degree in English. She then worked for a year as a "paraeducator for kids with mild to moderate disabilities in grades K through 2" before returning to the university get her teaching license. She previously worked as a research assistant studying reader identity with tablets versus traditional books. As a part of getting her teaching certificate, she took IPT 286, which was the first technology class she had taken. She really enjoyed it and felt like she learned a lot. She had little technology experience before taking the class, other than just using her own technology. She did not describe herself as a "techie" but felt she's tech-savvy because she grew up during the "digital age."

Article #3: Who Cares About Digital Badges?

An Examination of Employers' Perceptions of the Usefulness of Open Badges

Who Cares About Digital Badges?

An Examination of Employers' Perceptions of the Usefulness of Open Badges

Daniel L. Randall – dan.randall26@gmail.com
Richard E. West
Brigham Young University

Author Biographies

Both authors are affiliated with the Instructional Psychology and Technology department at Brigham Young University and have been associated with the preservice instructional technology course that is the subject of this article.

Daniel L. Randall is a doctoral student studying online learning in higher education, collaborative innovation, and the use of video and storytelling in instruction. His research is available on Mendeley and his website, http://danrandall.com.

Richard E. West is an associate professor teaching courses on instructional technology foundations, creativity and innovation theories, and academic writing and research. He researches how to evaluate and design environments for fostering collaborative innovation, open microcredentials/badges, the development of online learning communities, and technology integration in secondary and higher education. His research is available on Academia.edu and at http://richardewest.com.

Abstract

In this article, we examined employers' perceptions of open badges. We emailed one of two forms of a survey to 577 principals and assistant principals in 5 school districts. Form A used wording about digital badges while form B used the term microcredentials. We compared the results of the surveys and examined the results of the open-ended questions. We found that using the term microcredential instead of the term digital badge does not have a significant effect on employers' perceptions on open badges. However, providing a small amount of instruction regarding the affordances of open badges does produce a statistically significant difference in the perceived value of open badges. Employers see the most value in achievement and capability badges. The evidence link and endorsements from established professional organizations are identified as important tools to employers. Most employers believed badges would be useful in the hiring process, but many worried about the challenge of having too much data.

Keywords: employer perceptions, digital badges, credentials, higher education, technology integration, educational technology

Who Cares About Digital Badges?

An Examination of Employers' Perceptions of the Usefulness of Open Badges

An increasing number of employers desire job candidates to demonstrate evidence of specific skills they have mastered (Mangan, 2015), especially if those skills are not apparent when looking at a degree or transcript (Blumenstyk, 2015). These include many soft skills, such as communication, teamwork, flexibility, and professionalism (Robles, 2012), as well as more specific technical skills (Pittinsky, 2015). While many of these skills can be gained in formal learning environments, they can also be gained in other settings. Regardless of where the skills are gained, it can often be difficult to effectively communicate those achievements to potential employers (Grant, 2014). For these reasons, several institutions and organizations have recognized the need for issuing microcredentials or digital badges to recognize individuals' skills, achievements, and strengths.

Issuing badges as learning credentials has a long history. Physical badges have been awarded by scouting organizations and other groups to signify skills and achievements and have often served as motivators. Badges first entered the digital medium as rewards in video games and for gamifying social media sites (Dona, Gregory, Salmon, & Pechenkina, 2014). They then spread to education to gamify formal and informal learning, as well as to recognize learners' skills and achievements (Abramovich, Schunn, & Higashi, 2013). In their simplest form, digital badges are merely digital images, but not all digital badges are created equal.

Open badges are a form of digital badge that have metadata tied to the digital image and can be issued and received by anyone (Goligoski, 2012). Besides preventing forgery, the metadata includes information about who issued the badge, what the badge was issued for, and perhaps most significantly, (a) what criteria is associated with the badge and (b) what the earner

submitted as evidence of having met those criteria (see Figure 1). As learners develop new skills, usually in smaller chunks, open badges can be awarded to showcase the new skills and the evidence of those skills via the open badge's metadata.

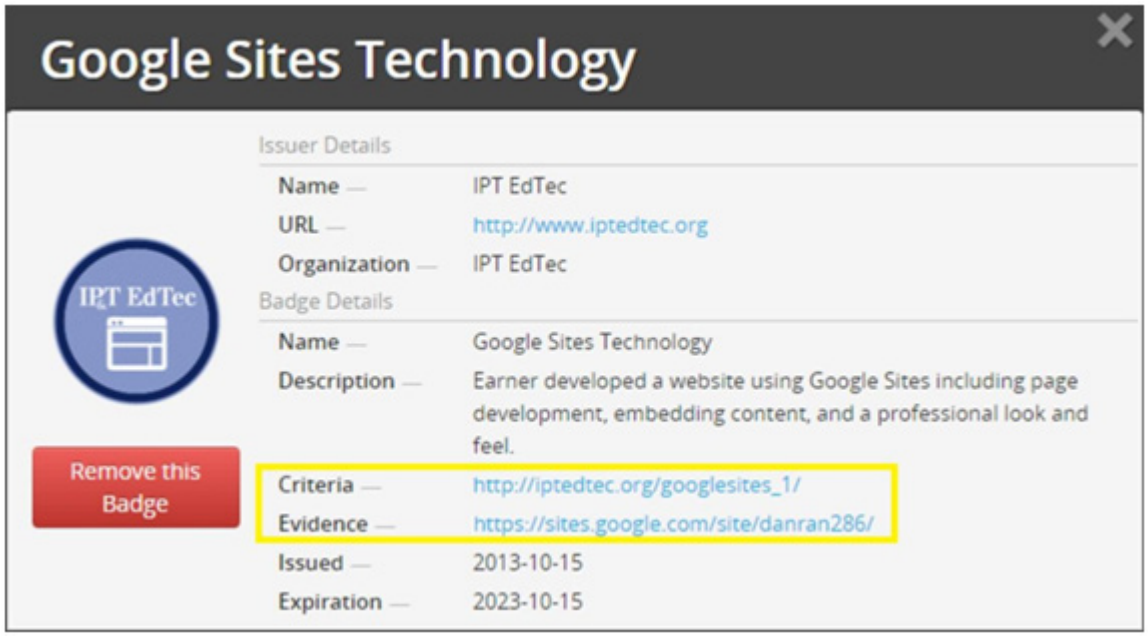

Figure 1. Metadata from an open badge. The highlighted area contains the links to the criteria and learner evidence associated with this badge.

The affordances of open badges give the earner control over his or her data and who they share it with. Open badges can be received from multiple issuers and stored in an earner's personal badge repository, known as a backpack (one such backpack is at http://backpack.openbadges.org). Within the backpack earners can create badge groupings and add badges to those groups to highlight specific skills or abilities. These groups can then be shared with potential employers and other interested parties. Since open badges are usually awarded for smaller chunks of learning and can be shared with others, many people have described them as a type of microcredential (Brandon, 2013; Goligoski, 2012; Young, 2012).

Despite the enthusiasm for using open badges to present employers with credentials, little research has been done to understand what employers might think of these badges and what could be done to make badges more useful to them. In this study, we seek to better understand employers' current perceptions of open badges. Specifically, we will try to understand how those tasked with hiring new personnel perceive open badges and what could be done to make open badges of most use to them. We hope this study will provide designers and other open badge advocates with additional information that could help them encourage or improve the adoption of open badges as microcredentials.

Literature Review

Many different institutions are beginning to issue a variety of microcredentials. We investigated the use of microcredentials in nontraditional institutions as well as at universities. Open badges specifically are being used in teacher preparation programs. However, the different types of open badges, and the terminology itself, requires further investigation to understand how educational hiring personnel currently perceive the usefulness of open badges.

Coding Boot Camps

Coding boot camps are a recent educational innovation that focuses on smaller increments of learning. While it's true that some boot camps are closing (for example, see Pender, 2017), commentators suggest the reason for these closures is not because the training was poor quality. Instead, they believe the closures are the result of an unsustainable business model some boot camps employed (Lohr, 2017; Pender, 2017). This seems likely as boot camps with different business models continue to thrive (Lohr, 2017; Sharp, 2017).

Kamenetz (2014a) stated that coding boot camps promise to teach software development or web programming skills in a short period of time at a fraction of the cost of a four-year

degree. A typical day at these boot camps might include a few sessions of direct instruction, with the largest portion of the day spent working on a project with a partner under the guidance of a class mentor who can provide just-in-time instruction. Perhaps most relevant to our discussion is the fact that most of these boot camps are not accredited. As such, it would seem that the brand of the boot camp, and the skills possessed by the student, are the sole factors allowing graduates to get jobs. Kamenetz (2014a) reported that General Assembly and similar programs usually "claim that 9 out of 10 of their graduates get hired, with starting salaries between $75,000 and $110,000" but notes that it's "difficult to independently verify these numbers" (para. 30).

General Assembly recognized the need for a formal credential and partnered with General Electric and other employers to produce microcredentials that can be earned by anyone successfully completing the assessment (Kamenetz, 2014b; Shieber, 2014). However, Chang, the founder of Code to Work, questioned the value of microcredentials created by partnering with employers, stating: "Trying to service the need of one or two employers is not the point. We're trying to get all employers to accept students. For that you've got to have a much more open ecosystem" (quoted by Kamentz, 2014b). Birnir, the founder of Skillcrush, had a similar reaction to General Assembly's new credentials: "Does it mean anything outside GE? Does it mean anything inside GE?" (Kamentz, 2014b). Clearly GE and the other partners believe there could be some benefit to using a microcredential, but what is missing is wider research on the perceived benefits and usefulness of these microcredentials to companies and employers today.

MOOCs and Other Online Learning

Like coding boot camps, providers of massive open online courses (MOOCs) are also offering learning in smaller chunks and are beginning to use microcredentials as well. MOOCs

are typically created by a collaboration of a university and a MOOC platform to create or adapt a regular university course and put it online, allowing anyone who wants to enroll in the course to do so for free or for a small fee. While most MOOCs do not offer traditional university credit, MOOC providers are beginning to offer other forms of microcredentials. Coursera allows users to pay for a certificate that certifies the learner successfully completed the course (https://www.coursera.org/signature/), as does edX (https://www.edx.org/verified-certificate). Both Coursera and edX also offer a type of microdegree certificate that is earned by completing a series of courses (https://www.coursera.org/specializations, https://www.edx.org/xseries).

Like MOOC providers Coursera and edX and coding boot camps, Udacity offers "nanodegrees" designed to teach students a set of skills. Like General Assembly, Udacity partnered with potential employers of their students, such as AT&T and Google, to create the credentials (Waters, 2015; https://www.udacity.com/nanodegree).

Clearly, institutions providing smaller increments of learning believe they can benefit from issuing microcredentials. However, are employers interested in these microcredentials? While it's promising that some companies have partnered with educational services to create microcredentials, it is unknown if the companies value the credential or only the collaboration on curriculum choices.

Open Badges in Universities

Many scholars have advocated for the use of open badges in higher education. For example, Moore (2013) stated that use of open badges metadata could "unbundle" education as we know it and allow students to be the decision makers regarding what to learn and who to learn it from, instead of universities (pp. 75–76). West and Randall (2013) imagined what an undergraduate web programming course could look like if open badges were recognized by a

professor. In their example, the professor could determine if a badge from another organization could meet some of the course's requirements and, if so, could allow the student to spend their time in the course focusing on other competencies covered by the course that the student has less expertise in. Such an approach could be particularly useful with open pedagogy strategies (Wiley, 2013) and could help to prevent the course from becoming too fragmented. Glover and Latif (2013) interviewed university staff and held focus groups with students and found that both groups favored the use of open badges in formal education, including communicating information to potential employers. These groups saw a number of potential uses for open badges such as helping higher achievers stand out and acknowledging skills or abilities that are not normally acknowledged with typical university degrees.

Open Badges in Teacher Education

Like coding boot camps and similar programs, there are ways for would-be teachers to gain a teaching license without the completion of a teacher preparation program at a university. Groups such as Teach for America and state-sponsored alternative licensing programs have long provided such paths, although with questionable results regarding how prepared the new teachers are (Laczkod-Kerr & Berliner, 2002; Xu, Hannaway, & Taylor, 2011). These programs could benefit from the use of open badges to highlight their graduates' skills and abilities. Even university teacher preparation programs have begun to offer badges to highlight their students' accomplishments. For example, Purdue is using their Passport system, which is compatible with open badges (Newby, Wright, Besser, and Beese, 2016). The Passport system allows instructors to generate badges for competencies in a course and then create a series of tasks learners must successfully complete to earn each badge ("Passport," 2017).

Badge Types

Thus far we have looked at examples of people using open badges to credential competency-based learning and learning taking place in other rigorous learning environments. However, since open badges are "open," anyone can use them to credential anything they want (Goligoski, 2012). Instead of issuing a badge once a competency has been met, the badge could be issued to show a person's competency is building (The Mozilla Foundation, Peer 2 Peer University, & The MacArthur Foundation, 2012). Open badges could be awarded for participating in an event, course, or some other activity (Casilli, 2014), or having a particular role in a group (O'Byrne, Schenke, Willis, & Hickey, 2015). Open badges could even be issued to recognize a person's soft skills (Devedžić & Jovanović, 2015). While badges could conceivably be issued for anything, in this study we defined six different categories or badge types:

- Participation or activity—a badge for participating in an event, course, or activity or for completing some task
- Membership—a badge for joining or belonging to a group or organization
- Capability—a badge representing evidence of developing competencies or skills
- Achievement or mastery—a badge demonstrating mastery, or excellence above capability, of competencies or skills
- Role—a badge representing a role that the earner played within an organization or group
- Soft skills—badges related to soft, or human-centered, skills, such as creativity, curiosity, teamwork, teachability, etc.

Lightweight Badges and Microcredentials

Some badge types are believed to be "lightweight" (Casilli, 2014), meaning they can be easily obtained compared to badges with more rigorous requirements. Participation badges are often thought of as lightweight badges because they are frequently awarded to people simply because they were present. While some advocate the usefulness of lightweight badges (Casilli, 2014; Knight, 2014), others worry that lightweight badges provide little value and could even be damaging to the badging movement by weakening the value of the term "badge" (West & Randall, 2016). Even Catalano (2014), who admitted that lightweight badges within a contained environment like a classroom could be useful, argued that using them creates a risk of people equating all open badges as equivalent. Catalano (2014) wrote that while open badges have great potential because of their affordances, issuing badges for inconsequential things "squanders the potential of Open Badges" (para. 9). He believes that for open badges to succeed "they will need to mean something to more than just those who give them or get them . . . [they] need to be valuable to a third party. They need mass" (para. 9). Mass could include things like a well-known issuer or endorsement that would give the badge a sense of quality, and rigorous assessment practices that provide evidence that the competency the badge represents was met.

Many believe the term badge already carries a negative connotation, possibly because it is associated with lightweight badges such as those seen in video games and social media. For example, Presant (2016) said when he speaks with people new to open badges he has become very careful about the terms he uses. While the phrase "digital credentials using the Mozilla/IMS Global standard" (para. 6) is a mouthful, it allows him to avoid the word "badge." Many open badge proponents have begun to use the term microcredential (Foster, 2014). However, Ravet (2015) argued that this term is also problematic because it is not an accurate

description. For instance, not all microcredentials are open badges, or even digital badges. Conversely, open badges need not be limited to credentialing small chunks of learning or experience. Universities, if they desired, could even use an open badge to represent a formal degree. Instead, Ravet suggested the term "progressive-credential," although this term has not seen the wide adoption that "open badges" and "microcredentials" have seen. Few if any studies have been conducted to see how employers' initial perceptions might be affected when the term microcredential is used instead of digital badge or even open badge.

Research Questions

In this study, we seek to learn how hiring personnel in elementary and secondary education perceive open badges and what could be done to increase the usefulness of an open badge system from an employer's perspective. Specifically, we considered the following:

1. What are the initial perceptions of principals and other hiring personnel in public education about open badges as a teacher credential? Does referring to them as microcredentials instead of open badges make a difference?
2. Does educating hiring personnel about open badges affect their perception?
3. What do principals most value when making hiring decisions? How can/would badges influence those decisions?
4. How could badge credentials be strengthened to carry more weight and influence with public education hiring personnel?

Methods

To answer our research questions, we emailed a short survey to 577 principals and assistant principals in seven local school districts and a local charter school. After one to two weeks we sent a reminder email to those who did not fill out the survey. A final reminder email

was sent anywhere from a few days to a month after the previous email to those who still had not responded. Respondents had a chance to win a $50 gift card if they completed the survey.

Survey Instrument

Two forms of the survey were used. Both forms were identical, except form A used the term digital badge while form B used the word microcredential. We did this so we could see if using a different term would significantly change respondents' perceptions of open badges. The survey included questions about basic demographics, how much respondents knew about digital badges/microcredentials, and a question asking them to rate how impressive they thought digital badges/microcredentials would be as part of a resume or portfolio (ranging from 1 = *Not impressive at all* to 4 = *Very impressive, I would consider a candidate with these credentials over other candidates*). After responding to these questions, a short video (https://goo.gl/eZ5Zjz, https://goo.gl/gGNsYu) played explaining the affordances of open badges (form B explained the same affordances but used the word microcredential). Respondents were again asked to rate how impressive they thought badges would be now that they had more information. Respondents were then asked to rate the usefulness of various attributes of open badges and rate the value of different badge types. Finally, several open-ended questions sought to understand what aspects of open badges respondents liked or disliked, and what changes or improvements would make open badges more useful to them.

Data Analysis

We used non-parametric alternatives to parametric analysis methods to accommodate the non-normality of the interval data produced by both forms of the survey. To determine if there was a statistically significant difference between the initial perception of open badges compared to the initial perception of microcredentials, we used a Mann-Whitney *U* Test, a non-parametric

alternative to the independent *t* test. We then used sign tests to see if the video instruction on open badges produced a significant change in respondents' ratings of open badges and microcredentials. A sign test is an alternative to a one-sample *t* test that does not assume the data come from any particular distribution, whose null hypothesis is that the difference between medians is zero. Finally, we used the Mann-Whitney *U* Test again to see if there was a significant difference between how open badges and microcredentials were rated after respondents watched the video instruction.

To compare prior knowledge of badges and microcredentials, the importance of various attributes of badges, and the usefulness of different badge types, we took the mean of each group, and then compared the means with the appropriate groupings. We coded the open-ended questions for common themes regarding what aspects the participants liked and disliked about badges, and what suggestions they have in order to improve badges or make them more useful. Categories emerged based on themes that were generated through constant comparison analysis techniques (Glaser & Strauss, 1967), with special consideration for our research questions.

Results

Of the 577 people emailed, a total of 70 completed the survey (a response rate of 12%); 40 completed the badge form and 30 completed the microcredential form. Twenty-nine respondents worked in secondary education, and 41 were in elementary education. Forty-three were principals, while 27 were assistant principals or their equivalent.

Instruction is More Important than the Name

When asked what they knew about digital badges/microcredentials (prior to watching the video instruction), respondents could choose one of four options, from 1: I've never heard of

them, to 4: I'm very familiar with them. The average response for microcredential was 1.8 and the average for digital badge was 1.9. Fifty percent of respondents said they had never heard of digital badges, while only 45% said the same of microcredentials. Respondents then rated how impressive they thought a microcredential/digital badge would be as part of a portfolio or resume. They were asked the same question after they watched an instructional video about open badges. The results of these ratings are shown in table 1.

Table 1

Average Rating of Perception

Group	Average Rating
Microcredential before instruction	2.2
Microcredential after instruction	3.0
Digital badge before instruction	2.1
Digital badge after instruction	2.8

When comparing respondents' initial perceptions of open badges and microcredentials, the results of the Mann-Whitney *U* test showed that the ratings did not significantly differ ($U = 562$, $p = .653$). When comparing how respondents rated open badges and microcredentials, respectively, before and after the video instruction, the sign tests revealed that both were significantly different (open badges: $p = .000019$; microcredential: $p = .0004653$). Finally, when comparing the post-video instruction ratings of open badges and microcredentials to each other, the Mann-Whitney *U* test showed that the groups did not differ significantly ($U = 536$, $p = .453$). Based on these results, and the general lack of familiarity with the terms digital badge and microcredential, it appears that the terms used does not have an effect on how an employer new to digital badges/microcredentials might perceive their value in the hiring process. However, after receiving basic information about the credentials, their perceived usefulness significantly increased regardless of whether it was called a digital badge or a microcredential.

Importance of Badge Types, Badge Attributes, and Issuers

Since badges can be awarded for different things, we asked respondents to rate on a scale of one to four (four being the highest) how much they would value an applicant having any of the following types of badges:

- Participation or activity—a badge for participating in an event, course, or activity or for completing some task
- Membership—a badge for joining or belonging to a group or organization
- Capability—a badge representing evidence of developing competencies or skills
- Achievement—a badge demonstrating mastery, or excellence above capability, of competencies or skills
- Soft skills—badges related to soft, or human-centered, skills, such as creativity, curiosity, teamwork, teachability, etc.
- Role—a badge representing a role that the earner played within an organization or group

The average rating of each badge type can be seen in Table 2.

Table 2

Average Rating of Each Badge Type

Badge Type	Average Rating
Achievement	3.5
Capability	3.3
Soft skills	3.1
Role	2.6
Participation	2.1
Membership	1.8

While Achievement, Capability, and Soft Skill badges were within 0.4 points of each other, the Role badge type was rated 0.5 points below Soft Skill badges. Participation badges were rated another 0.5 points below the Role type, and finally Membership badges were 0.3

points below Participation badges. Based on these numbers, there seem to be three groupings, with Achievement, Capability, and Soft Skills badges on top, Role badges in the middle group by themselves, and then Participation and Membership badges together in the lowest group.

The results of the survey show that employers were far more interested in badges that showed the development and mastery of competencies or skills than any other type. It's important to note that while a badge that represents mastery (achievement badges) was rated the highest, there was only a 0.2 difference with badges that showed developing skills or competencies (capability badges). Respondents also rated badges for soft skills highly, being just 0.2 points below capability badges. The large number of responses to the open-ended survey questions (discussed below) that specifically mentioned either the need for soft skill badges, or the need for employers to see a candidate's soft skills, further demonstrated the importance employers placed on soft skills in general.

To understand what attributes of badges are most important to prospective employers, we asked respondents to rate each on a 4-point scale. The average rating of each attribute can be seen in Table 3.

Table 3

Average Rating of Each Attribute

Attribute	Average Rating
Evidence link	3.3
Description of competency acquired	3.2
Criteria link (rubric)	3.0
Endorsement from industry or professional organizations	2.9
Endorsement from educational entity	2.9
Badge image	1.7

Unsurprisingly, the evidence link was rated the highest, followed closely by the description of the competency. Slightly less importance was given to the criteria link, presumably because employers would rely, at least initially, on the description of the competency over the criteria

link. However, many of the open-ended responses mentioned the power and value of the being able to see the criteria required to earn the badge, so its importance should not be underestimated. It's interesting to note that endorsements were rated the same regardless of if they came from industry or professional organizations, or from educational entities. This might suggest that public school employers are less interested in the source of a badge than they are in evidence of achievement.

Finally, we examined how important the type of organization that issued the badge was to the respondents, again with a 4-point scale. When looked at in this light, there is a clear separation between well-established institutions and more alternative issuers (Table 4).

Table 4

Average Rating of Importance of Badge Issuer by Organization Type

Badge Issued by	Average Rating
University	2.8
Other school districts for professional development	2.7
Nation-wide consortium of educational entities	2.7
Non-university educational institutions (coding camps, technical programs, museums, etc.)	2.1

While displayed here in two separate tables for convenience, the question of who issued the badge was part of the same survey item as the other badge attributes listed in Table 3. This means that endorsements were rated slightly higher than any group that might issue a badge. It seems that who issues a badge is important, but who endorses the badge is just as critical, if not more so. Badges issued by non-university educational institutions were rated quite a bit lower than all the other issuers.

Usefulness in the Hiring Process

Eighty-one percent of respondents said badges could be helpful in the hiring process by allowing employers to see a candidate's competencies, skills set, or other strengths and

qualifications. One person said the ability to "drill down . . . to see exactly what their skill set looks like . . . is powerful stuff." Another said, "I think the badges would be more beneficial than a portfolio and easier for me to really take a look at a candidate . . . they are certainly less cumbersome and could be reviewed prior to an interview." Several suggested badges would help them to "narrow the applicants based on their qualifications" so they could "focus on those who are most qualified." Several said this would be particularly true if they were trying to find someone with a particular skill set, especially technology skills. Said another,

> I have always thought that sifting through a large number of resumes was not enough information to base a decision on who to interview. I believe this data could help in the interview selection process. For the hiring process, it would still be a factor with the interview and a scheduled visit to watch a mini lesson being taught.

Earning badges and displaying them could even help applicants gain more attention. One respondent said, "the more badges a candidate has, the more likely I would be to look at things other than just their resume." Another said that badges, "enhance a person's chance to be hired," although they wouldn't replace the need for a four-year degree. One respondent felt badges could be useful in showing not just an applicant's skills, but also their experience:

> I often ask how candidates have successfully implemented technology into lessons they have taught. A digital badge could potentially show that experience and capacity very clearly.

One person believed badges would "be helpful in verifying claims by job candidates," while another suggested badges could provide them with the ability to "directly compare candidates using a third-party system." Three respondents specifically mentioned that microcredentials might be a way to determine a candidate's weaknesses or deficiencies.

Challenges to Using Badges in the Hiring Process

Seven percent of respondents said they could not think of any negative aspects. One person even said, "I can't think of a situation where digital badges would not be useful." However, most people came up with some potentially negative aspects of using badges in the hiring process.

Too much time and too much data. At least 23% of respondents reported concerns with how much time it would take to review the badges presented to them and that they could be overwhelmed with data. "I barely have time to sort through the applicants, set up interviews and check references in the rush to hire before the candidate gets picked up by someone else. I don't believe I would have much time to look through these micro credentials." While acknowledging the extra time it could take, one respondent noted that just looking at the icons can give you a sense of the person's skills.

Meeting in-person and soft skills. At least 17% of respondents reported that badges would not be useful in the hiring process when it comes to determining a candidate's personality and possibly their soft skills. As one person put it, "microcredentials do not exist for a well-rounded teacher," and another said, "the credentials are helpful, but not a make-or-break criterion." While badges can help narrow an employer's search, several expressed the need to still meet with the candidate in-person. "Hiring is still a people business, especially in education. I don't care how many badges you have if you can't relate to other people or convey the information to others." One respondent's response was representational of several others. She said,

> Most of my hiring decisions are based upon how the preservice teacher did during their practicum and student teaching/internship experiences and how they inter-relate during

the interview. I weigh that practical side of their experiences heavier than the coursework and grades since that is where their learning is applied.

Other qualities employers looked for included, "ability to take feedback," "individuals that have a sincere regard for students as individuals and are willing to love them as their own children," and "the candidate's personality and how they might fit in with a particular team." One respondent said, "I would rather talk with their cooperating teacher and university supervisor in a reference check than try to sort through and look at all of this."

Need for standardization. At least 11% of people noted the importance of badges being standardized or more universal. One respondent said, "unless they are consistent across universities they don't carry much weight" and would not be "useful at this time." A second respondent said, "you would need to have everyone who is applying using the system to be of greatest use." Another lamented, "if they are only in use by a single organization, they won't be of a lot of use to me, as I couldn't use them for comparing candidates coming from different institutions." A fourth feared that unless every university issued badges it would be unfair to candidates who didn't have the opportunity to earn them. Similarly, someone pointed out that the badges would need to be aligned to the job description for them to be useful. Someone suggested badges that were based on national standards would be useful when considering out-of-state candidates.

Other Concerns and Possible Solutions

When asked if there were any additional concerns, 23% of people reported that they had no further concerns. Seventeen percent had questions regarding the accuracy and security of badges, such as, "how do we know if information is accurate," and "how do I know the credential represented by the badge can be trusted?" Others voiced concerns about the rigor of

the assessment required to earn the badge: "would they just be a hoop someone could complete to artificially inflate their actual competencies?" "How confident can I be in the organizations awarding them? Was the person able to hide in a group that earned it together?" One person said, "I would also have concerns about badges losing their significance. I wouldn't want them handed out for insignificant reasons." A few people were concerned that badges could be "another hurdle for teacher candidates." One even asked, "why are we making it more difficult for candidates (teachers) when there aren't enough candidates to begin with?" Someone felt the idea of badges sounded like "a solution looking for a problem."

When we asked what could be done to resolve the concerns they had, comments fell into one of three groups. The first said they would need experience using badges in the hiring process or be told by others that they are effective. Similarly, more widespread use of badges could also put them at ease. The second group said the reputation of the institution issuing the badge could ease their concerns. This could include universities, professional groups, and badges that were endorsed by the state or district. The third group was a collection of miscellaneous comments. These included things like badges would "need to work consistently without technical issues." One person wanted assurance that "the candidate cannot access or edit certain components of the badge so that . . . the data is reliable." Another suggested they would have more confidence in badges if they had a chance to earn a badge themselves.

Suggested Improvements

Several people mentioned the need for candidates to have soft skills. Respondents specifically mentioned "presence, voice, relationships and mindset (growth or fixed)," "classroom management, collaboration," and other similar skills. While some doubted the

usefulness of badges to convey such information, others said badges would not be useful to them "until microcredentials exist in the soft skills associated with teaching."

Other suggestions included using badges to represent teaching endorsements, having video clips attached showing the candidate teaching, making sure badges are easy to access (both before and after an interview), and having some kind of software to compile and compare candidates based on the badges they have and the needs of the school.

Badges for Professional Development and Other Uses

When asked if badges could be a useful way to recognize professional development or other advanced training, 56% respondents said they thought it would, while just 6% said they thought it would not, and 14% said maybe. Of those who said badges would be useful with professional development, some felt badges "would be useful in the relicensure process for a teacher," for "tracking all kinds of small professional development activities," and when hiring a "teacher from another district." One person said,

> I think it would be a motivator for teachers and an indicator to administrators of teacher growth and it would provide administrators a tool to know which teachers have competencies in certain areas so they could use them to help others.

A few respondents identified other potential uses for badges. These included the following:

- Rewarding "staff with badges for outstanding achievement."
- Using badges to "quickly identify staff members who have a skill that would be helpful to another staff member."
- Show what a teacher working on an advanced degree had learned even though they had not yet earned the degree.

- "If endorsed by district administrators [they could provide an] avenue to planning and tracking training for staff and faculty."
- Use badges to brand their school by showing off the skills of the faculty members.
- Award badges to students when they have mastered a standard, thus providing evidence to parents and other schools of the student's abilities.

Recommendations

Based on the feedback from employers, we make several recommendations for how employer perceptions of badges can be improved, how the global badge ecosystem could better serve employers, and recommendations for individuals designing an organization's badge system.

Educating Employers about Badges

Teaching educators about the affordances of open badges appears to be more effective in pushing the badging movement forward than just changing the name. In our study, respondents' perception of badges improved significantly after watching a two-minute video. They still had many questions and some of their concerns seemed to come from a lack of understanding about the nature of open badges. More education about open badges could further improve employers' perceptions and could ease some of their concerns. This could be especially true if employers were taught effective, but quick methods for sorting applicants based on the badges they had earned.

Using Badges in Job Applications

Respondents who were fairly positive and those who were fairly negative regarding the usefulness of badges both worried about the extra time reviewing badges might add to the selection process and said that in-person interviews were still necessary. We completely agree

with both assumptions. Open badges can provide an extensive amount of information, which could be meaningful in some situations and burdensome in others. One possibility is for employers to use badges to quickly narrow down their pool of applications based on the candidates' badges and fit for the position. From there, the employer can look at the additional data in an individual's badges, if desired. For instance, a school that has a large iPad initiative might focus especially on candidates that had badges for iPad integration. Employers could then look deeper into the badge information to identify which candidates seemed to have produced the best work. At this point they could bring this smaller group of applicants in for interviews. We believe there are several features that could expedite this process, as explained in the following sections.

Standardization and universality. Several respondents worried about the challenges that might be involved if badges are not standardized. Having some kind of standard would also save time as each applicant's badges would not need to be reviewed in detail. There are several ways this problem could be addressed depending on the level of standardization desired. The most extreme case would be a set of national standards (both the competencies and the assessment processes) that all badges must follow exactly. A less extreme approach is to have a set of core competencies for a standard but allow individual institutions to add additional competencies. As a result, the core of the standard would be met by all the badges, but not all the badges would be equal. This could still lead to a level of complexity that may be undesirable. Perhaps a more balanced approach is for universities and other interested entities to join together to form consortiums with agreed upon core competencies for a set of agreed upon standards. This would lessen the amount of "flavors" a badge for a particular standard would have.

Another approach to is to utilize the endorsement metadata field. Universities, professional organizations, districts, states, and other groups could choose to endorse a badge. Then regardless of who issued the badge, or even what the badge standard was, an employer could know the badge has rigor and is worth noting when selecting who to interview.

Saving time through brand recognition. Although going through the first few badges from a university or consortium might take a fair amount of time, once the rigor or worth of those badges has been established, simply seeing the brand of the badge might provide all the information needed at the moment. Badge brands could be vetted not just by the individual principal but also by HR departments. Endorsements from organizations that already have a recognized brand could further strengthen the brand of a university or consortium's badges.

Software for comparing candidates and their badges. As suggested by several respondents, it would improve the utility of badges if systems were developed that could sort badges and pull top applicants to the top of the list, or sort through candidates by specific skills, endorsements from specific organizations, and so on. From there, employers could review the information more in-depth to decide who to interview.

Other Recommendations for Badge Designers

In addition to the topics already discussed, we recommend badge designers do the following:

- Consider the category of badges employed—employers saw little value in participation and membership badges. This likely would extend to any badge that lacked rigorous criteria and assessment practices.
- Provide quality evidence—the evidence link was considered the most important aspect of the badge. Not utilizing it lessens the usefulness of the badge by greatly

reducing the information a badge can carry. We recommend linking to a webpage that displays all relevant information and products used to meet the badge's criteria or using some other method that can retain all the relevant information.

- Endorsements—seek endorsements from well-known organizations in your industry. Having an endorsement is important as it lends credibility to the badge and could serve as a way for employers to quickly assess the value of the badge.
- New metadata fields—consider creating new metadata fields or using the evidence field to link to a webpage with letters of reference, videos of the candidate teaching, and other potentially useful info.
- Soft skills badges—many respondents mentioned the importance of soft skills. While it's still advisable to interview a candidate and see them teach, the use of soft skills badges could prove beneficial in determining who to interview

Limitations

While this study was informative, it is limited by several factors, including sample size, the fact that all respondents work in the same state, and that it was limited to the field of education. Additionally, it reflected the attitudes of employers at present. If open badges become better known or adopted, perceptions might change. Finally, the current teacher shortage makes the need for teacher candidates to stand out above peers less important than other kinds of job seekers.

Future Research

More studies are needed with larger sample sizes in more regions and in other, non-education, fields to determine if these findings hold true. Additional studies could be done over a period of several years to see if employers' perceptions are evolving and, if so, what might be

the primary factors driving that change. Perhaps most importantly, similar studies should be done in many other industries and fields. These studies could also compare employers' perceptions to other relevant factors, such as a limited pool of candidates, skills gap, and other industry-specific conditions to see how these conditions affect employers' perceptions.

Conclusion

In this study, we surveyed principals and other hiring agents in elementary and secondary education to better understand their perceptions of digital badges, microcredentials, and how the affordances of open badges might be useful to them in the hiring process. We found that referring to open badges as microcredentials instead of digital badges did not change respondents' perceptions about them but giving basic instruction about open badges did significantly alter employers' perceptions. We also found that achievement and capability badges were well-received, but lightweight badges (e.g., participation, membership) had less value. The evidence link, rigorous criteria, and endorsements from professional organizations and educational entities are important to employers.

While microcredentials, such as open badges, cannot replace in-person interviews, they may certainly improve upon current application systems. The employers we surveyed felt the urgency for new ways to filter candidates and better understand their real abilities. One person said he wanted "direct recommendations from people" because, "[candidates] can look impressive on paper, but that does not mean they are impressive." The powerful potential of open badges and other open, digital credentials is their ability to show evidence, criteria, and other data clearly so that employers can better see past the resume fluff and more clearly discern the true nature of a person's accomplishments, abilities, and qualities. As one employer said, this is "powerful stuff" with the potential to improve hiring practices.

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DISSERTATION CONCLUSION

In this series of articles, I have investigated the use of an open badge system—both in an undergraduate technology course for preservice teachers and from the perspective of their potential employers. Using design-based research, I iterated on the design of the badge system as well as investigated other aspects critical to the success of the badge system. These included how to scale our badge system and make sure it met the needs of multiple stakeholders.

In article 1, we presented the challenges present in IPT 286, which included the need for differentiated instruction across multiple content areas and technological abilities, as well the need to encourage learning beyond the one-credit course. The article detailed the design, development, and implementation of a badge system in IPT 286 and demonstrated how an open badge system could help meet the challenges described. Several future design implications were identified, including how to scale the badge system while maintaining quality control of both the assessment process and the badge creation process, and achieving financial sustainability. Future research implications included determining if awarding badges provided students with additional motivation, and what employers' perceptions of badges might be, including if applicants benefited from displaying their badges.

Article 2 focused on the next iteration of the badge system, specifically increasing the scale of our badge system while maintaining quality, as identified in article 1. We had previously tried to make content-specific badges for content areas we did not have expertise in and found the quality of our badges lacking. We believed a financially viable solution to this problem was to hire undergraduates with expertise in content areas we were unfamiliar with to work as instructional design assistants (IDAs). We found that using undergraduate IDAs enabled us to create many new badges much quicker than we could have done alone. Using IDAs did not

affect the quality of the badge rubrics produced, and in cases in which IDAs created content-specific badge rubrics, the quality was higher than what IPT 286 instructors had produced previously. We found that employing IDAs not only benefited our project but also provided many benefits to the IDAs, such as increased technology skills and professional growth. Being an IDA helped some IDAs catch the vision for open badges, so that by the end of their employment with us all IDAs were excited about the possibilities open badges might provide. However, despite their enthusiasm for badges, no former IDAs chose to display their badges when seeking employment, either because they thought principals would not know what they were, or it was not easy to display them (they just wrote out the skills on their resume instead). Finally, we provided several practitioner tips for those hoping to similarly employ IDAs. These tips included a positive mentoring relationship, providing IDAs with ownership of projects, and encouraging peer collaboration among IDAs.

In article 3, we looked at employers' perceptions of open badges. We chose to examine this so we could learn how to make our badges useful to employers and, by extension, to our preservice teachers. We found that using the term microcredential instead of digital badge did not create a significant difference in the value placed on the credential by the employers surveyed. We did, however, find that a small amount of instruction regarding the affordances of open badges did produce a statistically significant difference in the perceived value of open badges. Employers saw the most value in achievement and capability badges and expressed the importance of soft skills in general. The evidence link was identified as an important affordance to employers that should not be overlooked by badge designers. We also learned that badge designers should seek endorsements from established professionals or other organizations, as endorsements add to the perceived value of a badge even more than the institution that issued it.

Most employers believed badges would be useful in the hiring process, especially when determining whom to interview. However, many worried about the challenges that having too much data might create. Finally, we found that many employers thought badges could be useful in professional development and relicensing if endorsed by their district or state. Based on these findings, future iterations of our badge system should include endorsements from professional organizations as well as provide more instruction to preservice teachers about the value employers see in badges and how they could be leveraged in the application process.

Design-Based Research and Model Development

While design-based research is typically used to develop theory (Barab & Squire, 2009), it can be used for model development (Wang & Hannafin, 2005). The development and refinement of the IPT 286 badge system, as described in this dissertation, follows the latter trajectory. Because of this process, our badge model has developed to the point that other universities have begun creating similar badge systems to support preservice teacher technology education. For instance, an important aspect of the IPT 286 badge system is that the badge brand is copyrighted, but the content (such as the badge rubrics) uses a Creative Commons license so other universities can reuse our materials. Other universities, such as Purdue and Memphis, have followed our example by also using a Creative Commons license for their badge materials. The result is that an exchange network now exists in which content created at BYU has been able to be used at other universities, while BYU has benefited from the ability to adapt badges made by other universities to increase our catalog of badge options.

Our work on the IPT 286 badge system, including our discovery that employers' perceived value of a badge could greatly increase if the badge is endorsed by professional organizations, has had an effect on these some of these organizations. The Association for

Educational Communications and Technology (AECT) created a badge committee that is tasked with reviewing badges submitted to AECT and deciding if AECT should endorse a badge. It also led to the creation of the National Badges Consortium, which is working with international educational technology organizations to get their endorsement of a badge system that can be used in teacher preparation programs around the nation. The badge system being proposed by the consortium uses the IPT 286 badge system as a model for its foundational badges. Even organizations outside of teacher education have considered the value of endorsing badges based on our badge system (Davies, Randall, & West, 2015).

Future Research

While the articles in my dissertation provided some insights into the usefulness of open badges, particularly in higher education, more research is required. Several studies are needed to understand employers' perceptions of open badges in other fields and industries. Also, my research showed that hiring agents in elementary and secondary education saw little value in certain types of badges. Studies that examine if this holds true in other employment sectors would be helpful in determining if some badge types are most useful in one field compared to another. Similarly, educators saw little value in badges awarded from non-traditional institutions. As more people enroll in coding boot camps and other non-traditional programs, it would be helpful to know if a badge or any certification from such programs would be seen as valuable to employers in the technology sector and other fields.

Research is also needed to further examine how IDAs could be useful in other fields. Do IDAs who are not preservice teachers still produce quality badge rubrics? Can TAs be trained to grade project submissions from alumni and other external individuals while maintaining quality? While IDAs and TAs are relatively inexpensive, it is still unclear how much such a system could

scale and still be financially sustainable. Would a small fee for grading submissions be enough to balance financial sustainability and still scale as needed? Would people be willing to pay such a fee? Studies that seek to answer these questions are needed.

Perhaps the biggest unanswered questions revolve around using a badge system in other fields, especially fields that are not so easily compartmentalized. Would such a modularized system be as effective in history or literature? Would badges have the same usefulness or worth as a credential if they were issued for topics such as Introduction to British Literature instead of Introduction to JavaScript? A study that looks at the use of open badges in non-technology undergraduate courses could provide valuable insights.

Future Potential of Open Badges

In article 1, we said we believed open badges had the potential to be a disruptive innovation in higher education. Elsewhere we speculated that open badges could be earned outside of the university but count toward completing a course or degree (West & Randall, 2016). Modularizing university courses, or even whole degrees, and accepting badges from other organizations could provide students with an opportunity to spend their time at university focusing of topics they have less experience with, or have struggled to learn on their own, instead of rehashing topics they are already familiar with. Such an approach could even be used to shorten the path to graduation by allowing skills gained previously to count towards graduation. If so, universities may be able to serve more students while simultaneously reducing the cost of an individual's education. Some people may find they do not even need to attend a university to acquire the skills they need to be marketable in their chosen field.

For these possibilities to be realized, open badges must be used by more than just early adopters; they must become widely used in education and in industry. Institutions and

businesses that use or recognize badges should publicize their use of badges so more people are aware of their value. In connection with this publicity, care should be taken by all parties to make sure quality assessment and issuing practices are used so badges maintain rigor. Without this rigor badges may be viewed as having little value (West & Randall, 2016). Only when open badges are recognized as legitimate credentials by educational institutions, employers, and the individuals who could earn them will they have the lasting power to affect change in education and industry.

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