Dirk Ifenthaler
Nicole Bellin-Mularski
Dana-Kristin Mah *Editors*

Foundation of Digital Badges and Micro-Credentials

Demonstrating and Recognizing Knowledge and Competencies

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Editors
Dirk Ifenthaler
University of Mannheim
Mannheim, Germany

Deakin University
Melbourne, Australia

Dana-Kristin Mah
University of Potsdam
Potsdam, Germany

Nicole Bellin-Mularski
University of Potsdam
Potsdam, Germany

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Preface

Digital Badges represent a valid indicator of specific achievements, knowledge, skills, and competencies that can be earned in formal and informal learning environments. Digital Badges represent an opportunity to recognize such achievements through credible organizations that can be integrated in traditional educational programs but can also represent experience in informal contexts or community engagement. Furthermore, instructional designers can use badges to motivate and influence engagement by providing for example focused goals or challenging tasks.

Digital Badges are a relatively new technology and therefore acceptance depends on the level of quality control, the actual design, and implementation in learning environments. They offer a form of recognition of learning, with a focus on qualifications like problem-solving, self-management, flexible, and individual learning achievements, and provide information to relevant stakeholders when they are digitally linked with user profiles or shared in social networks. But implementing digital badges in learning environments can be challenging, because different forms of assessment require new forms of instruction and a clear understanding of learning outcomes.

This edited volume aims to provide insight into how digital badges may enhance formal and informal education by focusing on technical design issues including organizational requirements, instructional design, and deployment. It features current research exploring the theoretical foundation and empirical evidence of the utilization of digital badges as well as case studies that describe current practices and experiences in the use of digital badges for motivation, learning, and instruction in K-12, higher education, workplace learning, and further education settings.

We organized the chapters included in this edited volume into four major parts: (I) *Theoretical Foundation of Digital Badges*, (II) *Technological Frameworks and Implementation*, (III) *Learning and Instructional Design Considerations*, and (IV) *Case Studies: Practices and Experience*.

In Part I, chapters address theoretical perspectives (e.g., learning, motivation, assessment) relevant to the issues and challenges educators are facing when implementing digital badges and micro-credentials. In the first chapter, the authors provide a historical overview and discuss motivational aspects, issues, as well as challenges of digital badges and micro-credentials to provide insight and clarity into the various uses and functions in the modern world (*Larry E. Ellis*, *Sandra G. Nunn*, *John T. Avella*, Chap. 1). The next chapter challenges the "philosophy" of digital badges by addressing a variety of epistemological concerns including the intersection of challenges to conventional educational motivation, suggestions of how Platonic and modern models of education are complementary, and implications of how badges may represent postmodern credentialing systems (*James E. Willis*, *III*, *Kim Flintoff*, *Bridget McGraw*, Chap. 2). Next, the ideas and aims of higher education and the needs of the sector to continually innovate to meet workforce changes and labor market demands are discussed in the light of micro-credentials and open badges as approaches to locate, measure, and validate learning (*Melinda J. Lewis*, *Jason M. Lodge*, Chap. 3). The following chapter explores drivers, affordances, and challenges for the use of digital badges by drawing on historical roots and influences such as lifelong learning, opportunities, and challenges (*Alison Lockley*, *Anne Derryberry*, *Deborah West*, Chap. 4). Then, ways in which micro-credentials' public promises may be designed into the credentialing process are explored and a simple method for creating an evolving evaluation strategy is proposed (*Sharon L. Gander*, Chap. 5). The next chapter examines the different design challenges involved in building collective belief in badges to increase their perceived value (*Sheryl Grant*, Chap. 6). The final chapter of this part outlines three primary roles of digital badges for supporting learning journeys in higher education (*David Gibson*, *Kathryn Coleman*, *Leah Irving*, Chap. 7).

In Part II, chapters focus on insights into available technology for designing and implementing digital badges as well as organizational requirements for the deployment of digital badges. The first chapter of this part provides an insight into current features of badging platforms, and thus help one make more informed decision when choosing a platform for a specific application (*Sonja Dimitrijević*, *Vladan Devedzić*, *Jelena Jovanović*, *Nikola Milikić*, Chap. 8). Next, a university-based research team reports efforts to plan and launch badging systems at two levels: (1) individual course level; and (2) program level (*Brent G. Wilson*, *Crystal Gasell*, *Aysenur Ozyer*, *Len Scrogan*, Chap. 9). The argument of the following chapter is that designing instructional badges presents unique opportunities and challenges, and proper preparation and planning are necessary for the success of the badge (*Timothy Newby*, *Casey Wright*, *Erin Besser*, *Elizabeth Beese*, Chap. 10). The next chapter explores how badging programs can help organizations build and achieve learning culture (*Mark Aberdour*, Chap. 11). Next, the chapter suggests that structures must be in place to ensure transparency and confidence in the badging process, as well as trust amongst badge earners, issuers, and consumers (*Deborah Everhart*, *Anne Derryberry*, *Erin Knight*, *Sunny Lee*, Chap. 12). The final chapter of this part explains how badging can be applied in academic and nonacademic settings; however, the focus is on preparing a university to use a badging system that is linked to faculty development and mentoring (*Jordan Hamson-Utley*, *Errin Heyman*, Chap. 13).

In Part III, chapters suggest learning and instructional design scenarios. In the first chapter of this part, the authors attempt to develop a framework for designing digital badge systems to help address the issue of distributed learning across various domains and contexts (*Cameron Wills*, *Ying Xie*, Chap. 14). The next chapter discusses digital age classroom practices, design strategies, and issues of digital badges (*Barbara Fedock*, *Mansureh Kebritchi*, *Rebecca Sanders*, *Alicia Holland*, Chap. 15). The following chapter argues that digital badges offer an opportunity to go beyond a seat time paradigm to more accurately and vividly document professional learning (*Kristin Fontichiaro*, *Angela Elkordy*, Chap. 16). The subsequent chapter looks to the evolution of badging on video game consoles and its roots in the virtual persona profiles in tabletop gaming to draw on the parallel experience of design and cautionary tales of how early design decision may have later ramifications (*Scott Beattie*, Chap. 17). The next chapter discusses the use of achievements within commercial video game design and development and summarizes research designed around specialized learning games designed to test the effectiveness of badges on learner variables such as performance and motivation (*Rudy McDaniel*, Chap. 18). In the following chapter, the concepts of digital badges as parts of digital portfolios are explored and two digital design patterns for badges-portfolio integration are proposed (*Ilona Buchem*, Chap. 19). The final chapter of this part explores the relationship between creativity, digital portfolios, and digital badges (*Kathryn Coleman*, *Keesa V. Johnson*, Chap. 20).

In Part IV, chapters include case studies, empirical research findings, and examples from institutions adopting digital badges. The first chapter of this part discusses findings from a 1-year exploratory study of an online teacher professional development program, and an accompanying digital badge system (*James Diamond*, *Pilar Carmina Gonzalez*, Chap. 21). The next chapter reframes the question "do badges work?" to explore *when* badges work and presents three cases studied by the Design Principles Documentation project to demonstrate dynamic uses of digital badges (*Rebecca C. Itow*, *Daniel T. Hickey*, Chap. 22). In the following chapter, a case study describes the conceptual development of a practice analysis, the results of the criticality analysis, building the micro-credential series, development of governance and administrative processes for badge issuance, micro-credential marketing, and future directions (*Sharon L. Gander*, Chap. 23). The findings of the next chapter confirmed the hypothesis that university students primarily view digital badges as a way to promote their achievements to potential employers; however, further research is suggested to determine the extent to which potential employers understand and value badges as evidence of achievement (*Ian Glover*, Chap. 24). The next chapter explores digital badges as a form of motivation within an organization using three different psychology theories and showing the relationship between motivation and digital badges (*Elizabeth C. Metzger*, *Laura Lubin*, *Rochelle Patten*, *Janelle Whyte*, Chap. 25). The following chapter considers the implementation of digital badges within the Australian context and presents a model which draws together contextual elements and more technical considerations for a badge system (*Deborah West*, *Alison Lockley*, Chap. 26). The final chapter of this part investigates a content-agnostic, skills-based digital badge intervention demonstrating mastery learning in select, age-appropriate, Next Generation Science Standards (NGSS) (*Angela Elkordy*, Chap. 27).

The edited volume closes with an *Epilogue* reflecting on different perspectives on digital badges and identifying future research of this emerging field (*Dana-Kristin Mah*, *Nicole Bellin-Mularski*, *Dirk Ifenthaler,* Chap. 28).

Without the assistance of experts in the field of digital badges, the editors would have been unable to prepare this volume for publication. We wish to thank our board of reviewers for its tremendous help with both reviewing the chapters and linguistic editing. Our thanks also go to Nadine Böckmann for preparing the chapters to meet the guidelines for editorial style.

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About the Editors and Contributors

About the Editors

Dirk Ifenthaler (dirk@ifenthaler.info and **www.ifenthaler.info)** is Professor of Learning, Design and Technology at the University of Mannheim, Germany, Adjunct Professor at Deakin University, Australia, and Affiliate Research Scholar at the University of Oklahoma, USA. His previous roles include Professor and Director, Centre for Research in Digital Learning at Deakin University, Australia, Manager of Applied Research and Learning Analytics at Open Universities, Australia, and Professor for Applied Teaching and Learning Research at the University of Potsdam, Germany. He was a 2012 Fulbright Scholar-in-Residence at the Jeannine Rainbolt College of Education, at the University of Oklahoma, USA. Professor Ifenthaler's research focuses on the intersection of cognitive psychology, educational technology, learning science, data analytics, and computer science. He developed automated and computer-based methodologies for the assessment, analysis, and feedback of graphical and natural language representations, as well as simulation and game environments for teacher education. His research outcomes include numerous co-authored books, book series, book chapters, journal articles, and international conference papers, as well as successful grant funding in Australia, Germany, and USA—see Dirk's website for a full list of scholarly outcomes at www.ifenthaler.info. Professor Ifenthaler is the Editor-in-Chief of the Springer journal *Technology*, *Knowledge and Learning* (www.springer.com/10758). Dirk is the Past-President for the AECT (Association for Educational Communications and Technology) Design and Development Division, Past-Chair for the AERA (American Educational Research Association) Special Interest Group Technology, Instruction, Cognition and Learning, and Co-Program Chair for the international conference series on Cognition and Exploratory Learning in the Digital Age (CELDA).

Nicole Bellin-Mularski (Nicole.bellin-mularski@uni-potsdam.de) is a research assistant at the Department of Applied Teaching and Learning Research at the

University of Potsdam, Germany. She received her M.A. and Ph.d. from Freie Universität Berlin, Germany, in educational science and eventually worked as a research assistant in the fields of curriculum development at the Technische University of Dresden and school development of full-day schools at the Department of Empirical Education at the Freie Universität Berlin. There her work concentrated on effects of class composition and SES and migration related achievement disparities in elementary education, and school organization related effects. Her current research focuses on technology integration in education, especially the development of ePortfolios in preservice teacher education where she is also responsible for student teaching.

Dana-Kristin Mah (dana-kristin.mah@uni-potsdam.de) is currently a doctoral candidate as well as research and teaching assistant at the Department of Applied Teaching and Learning Research at the University of Potsdam, Germany. She studied at the Berlin Institute of Technology, Germany, and Stockholm University, Sweden, to receive her master's degree in Educational Science. Her research concentrates on students' first-year experience in higher education with focus on students' perception of academic competencies and institutional support. Besides, she is interested in the potential of learning technologies on student retention in higher education. In particular, she explores learning analytics, digital badges, and ePortfolios.

About the Contributors

Mark Aberdour (mark.aberdour@leolearning.com) is a learning technologist with 20 years experience in the workplace learning technologies sector spanning multiple disciplines including software testing, LMS and platform development, and open-source services delivery. He has successfully established learning platforms service lines at several leading workplace learning vendors based in Brighton, UK. Mark has worked on over 100 learning platform implementations across a wide range of sectors including healthcare, defense, retail, finance, engineering, automotive, higher and further education, and local and central government. He is also a regular conference speaker and writes about learning technologies on his openthoughts.com blog and authored the book *Moodle for Mobile Learning* in 2013.

John T. Avella (jackavella@eduinnovationsllc.com) possesses more than 30 years of experience in education as a public school special education teacher, vice-principal, principal, and assistant superintendent before his retirement in 2010. He is presently an associate faculty member of the University of Phoenix for the doctoral program and a faculty member for Western Governors University in the masters teacher preparation and research program. Dr. Avella co-owns and co-administers an educational consulting firm with his wife called eduInnovationsllc located in Toms River, NJ. He is married with two daughters and two dogs. His interests include sports, music, and traveling.

Scott Beattie (s.beattie@cqu.edu.au) has been a gamer as long as he has been a learner, emerging on the 1970s wave of alternative schooling and early role-playing games. These experiences have informed his stance as an educator and his present responsibilities as a Deputy Dean (Learning and Teaching). The arrival of Digital Badging and the increasing importance of game-based learning have meant that the hours committed to gaming have not been the waste of time that parents and teachers feared. As a law academic, Scott's other research interests include censorship of digital media, regulation of virtual space, and the Creative Commons movement.

Elizabeth Beese (ebeese@purdue.edu) is a doctoral student of Learning Design and Technology at Purdue University in West Lafayette, IN.

Erin Besser (ebesser@purdue.edu) is a doctoral student of Learning Design and Technology at Purdue University in West Lafayette, IN. Her research interests include the intersection of collaborative instruction and mobile learning, instructional feedback within digital badge systems, preservice teacher education, and technology integration within K-12 learning environments.

Ilona Buchem (buchem@beuth-hochschule.de) is professor of Digital Media & Diversity at Beuth University of Applied Sciences in Berlin. She graduated with a master's degree in Applied Linguistics at the University of Warsaw (Poland), Concordia University (USA), and University Duisburg-Essen (Germany). She obtained her PhD degree in Adult and Business Education in 2009 at Humboldt University in Berlin. Her research and teaching focus on the intersections of digital media and society, with focus on emerging media such as social, mobile, and wearable media. Her research includes digital learning and communication, digital badges, digital portfolios, digital diversity, digital identities, digital games, and digital communities. Ilona Buchem is the Chair of the PLE Conference and the Chair of the Special Interest Group on Wearable Technology Enhanced Learning at the European Association of Technology Enhanced Learning (EATEL), the founder of the Europortfolio German Chapter, and a member of several organizations, including the Association of Media in Science (GMW) and the European Distance Education Network (EDEN). Ilona Buchem has been involved in a number of national and international projects as both a project coordinator and a researcher, including the project coordination of the EU project "Badge Europe" dedicated to open badges.

Kathryn Coleman (kate.coleman72@me.com) is a Lecturer and Project Manager at Deakin University in Melbourne, Australia. Kate has many years of experience teaching both secondary and higher education and is a Board member of the Association for Authentic, Experiential and Evidence-Based Learning (AAEEBL). Her research specifically focuses on the use of digital portfolios, open badges, and digital learning spaces in education and the arts for lifelong and lifewide learning. Kate has been investigating the integration of digital learning spaces, portfolios, and badges in the art world through research projects, book publications, and presentations.

Anne Derryberry (annederryberry@gmail.com) is a strategic advisor to learning institutions and learning technology providers. She is co-instructor of the MOOC, “Badges: New Currency for Professional Credentials.” She is contributor to *Campus Policy Framework for Open Badges*, a collaboratively written document produced by the Badge Alliance. Anne developed the Game-Based Learning Ecosystem Model and is co-author of *Game-based Learning: Developing an Institutional Strategy*, a research bulletin published by EDUCAUSE. She has written and spoken extensively on badges and alternative credentials, competency-based learning, and game-based learning. Anne is Donald W. Reynolds Fellow, Reynolds Journalism Institute, University of Missouri School of Journalism; her research focuses on games as a form of interactive storytelling in learning and journalism settings.

Vladan Devedžić (devedzic@gmail.com) is a Professor of Software Engineering at the University of Belgrade, Serbia. His current professional and research interests include technology-enhanced learning, software engineering, and application of artificial intelligence to education.

James Diamond (jdiamond@edc.org) is a Senior Research Associate at EDC’s Center for Children & Technology. As a formative researcher and learning scientist, his research looks at how tools such as digital games and digital badges can be used to support K-12 teaching and learning. Dr. Diamond is currently the co-principal investigator of a National Science Foundation-funded project to investigate how middle school teachers use data from game play to inform their instructional practices. He is also the principal investigator of an NSF-funded project to build partnerships with organizations in the USA and UK to plan for a study that will identify the structural features of badge systems that may allow for the alignment of learning objectives across formal and informal learning institutions. He contributes to numerous evaluations of initiatives that use technology to better engage, motivate, and educate students, as well as foster their civic literacy and participation.

Sonja Dimitrijević (dimitrijevic.sonja@gmail.com) is a Research Assistant at the Mihailo Pupin Institute, Belgrade, Serbia, where she has participated in several research and software development projects. She is also a PhD student at the Department of Software Engineering, Faculty of Organizational Sciences (FOS), University of Belgrade. Her current professional and research interests include software engineering, requirements engineering, and software usability.

Angela Elkordy (aelkordy@nl.edu) is an Assistant Professor at the National College of Education with a specialization in the Learning Sciences. She is also the Program Coordinator for the Technology in Education program. Through her scholarly work and teaching, she studies leadership, learning, teaching, and assessment, particularly in technologically and digitally mediated contexts. She teaches in a wide range of programmatic areas including learning and cognition, research methods, data and assessment for instruction, and instructional technologies such as digital games and learning. She earned a doctorate from Eastern Michigan University in the area of Educational Leadership, with a cognate in Instructional Technologies. Dr. Elkordy has always been interested in teaching and learning, knowledge construction, storage and retrieval, and instructional technologies. Before transitioning to academia, she worked in the fields of education, information science and technology as a teacher, school administrator, librarian, programmer, researcher, and school principal. She has extensive experience working with under-resourced schools with student populations which are linguistically, culturally, and economically diverse.

Larry E. Ellis (Docdistance7@email.phoenix.edu) taught at the University of Phoenix for 5 years and for over 10 years at several community colleges on a national level in business and education. He earned an MBA and MAEd at the University of Phoenix and a PhD in Distance Education at Capella University. He has held a number of administrative, technical, and professional positions including budget officer, risk manager, tax audit manager, systems analyst, project manager, reengineering specialist, administrative manager, legislative specialist, instructional designer, and training director. Publications include an article titled "Rubrics and Evaluations" and a historical fiction novel about Route 66 entitled *The Trail of the Oent'rfazr*.

Deborah Everhart (everhart@georgetown.edu) is a strategist and innovator, analyzing trends and designing holistic solutions for learning and teaching. She teaches as an Adjunct Assistant Professor at Georgetown University. She received her Ph.D. in English from the University of California, Irvine. She has co-led research on competency-based education, producing a series of roundtables with thought leaders and the publications *Clarifying Competency Based Education Terms: A Lexicon* (http://bbbb.blackboard.com/Competency-based-education-definitions) and *The Currency of Higher Education: Credits and Competencies* (http://bbbb.blackboard.com/CurrencyofHigherEducation). She is a contributing member of the IMS Global working groups defining standards for competency-based education and alternative credentials. She chaired the Badge Alliance working group that defined a conceptual framework and technical standards for badge endorsements in open badges ecosystems. Dr. Everhart has written and presented extensively on medieval literature, emerging technologies, learning analytics, badges, competency-based learning, and the future of learning and teaching.

Barbara Fedock (bfedock@juno.com) is a University of Phoenix School of Advanced Studies faculty member and dissertation chair, research fellow, Master's of Teaching Student Teacher Supervisor, and Lead Teacher and Content Area Chair in the College of Humanities and Science on the Charlotte, North Carolina campus.

Kim Flintoff (k.flintoff@curtin.edu.au) is a teaching/research academic at Curtin University. As a member of the Strategic Innovations in Learning Engagement team within Curtin Teaching and Learning his role involves developing innovative solutions aligned with the university's strategic vision of teaching and learning.

Kim began his studies and working life in Applied Science (Chemistry) but has subsequently established himself as a dynamic agent of change and provocation in Drama and Education. After many years as a versatile practitioner in the theater and performing arts, he became recognized locally as a curriculum leader and a global innovator and researcher in the role of technology in drama education. For a decade he convened the Special Interest Group for Drama and New Media (Science and Technology) with the International Drama Education Association, was an invited speaker at the inaugural global summit for the World Alliance for Arts Education, and has been a sought-after speaker and collaborator on technology-mediated education projects around the globe.

Kristin Fontichiaro's (font@umich.edu) work focuses on how adults can facilitate robust, rich, and engaging learning for youth in formal and informal settings. She is series editor for Cherry Lake Publishing's Makers as Innovators series, named by *Booklist* as a top ten nonfiction series. Her most recent edited volumes are *Navigating the Information Tsunami: Engaging Research Projects that Meet the Common Core State Standards*, *K-5* (2012) and *Growing Schools: Librarians as Professional Developers* (with Debbie Abilock and Violet H. Harada, 2012). She co-edited, with Buffy Hamilton, the crowdsourced *School Libraries: What's Now*, *What's Next*, *What's Yet to Come.* Earlier professional books include *21st-Century Learning in School Libraries; Active Learning Through Drama*, *Podcasting*, *and Puppetry;* and *Podcasting at School*. With Sandy Buczynski, she wrote *Story Starters and Science Notebooking: Developing Student Thinking Through Literacy and Inquiry.* She also writes middle-grade informational texts, including *Know What to Ask: Forming Great Research Questions* (with Emily Johnson) and *Shared Creations: Making Use of Creative Commons* (with Emily Puckett Rodgers). Former columnist for *School Library Monthly*, she has written for *Principal Leadership*, *ASCD Express*, *Teacher Librarian*, and other publications. She has been named a Mover and Shaker by *Library Journal* and an American Library Association Emerging Leader.

Sharon L. Gander, M.Ed., CPT, ID(SEL/SLG), CACP (idbadges@tifpi.org) is the Director of ID Certifications at The Institute for Performance Improvement, L3C, (TI*f*PI) where she was instrumental in the development of 17 learning solution certification micro-credentials with digital badges. Ms. Gander specializes in the architecture of learning such as credentials, learning solution development, performance improvement, and learning/knowledge infrastructures. She is among the first wave of certificants to complete the evidence-based Certified Assessment and Credentialing Professionals (CACP). As a Certified Performance Technologist (CPT) since 2005, she has renewed successfully every 3 years and participates as an application reviewer in the CPT double-blind review process for the International Society of Performance Improvement (ISPI). She was among the early adopters of TI*f*P's instructional design micro-credentials, receiving certification in the design and development of synchronous e-learning (SEL) and serious learning games (SLG) learning solutions. Ms. Gander has worked with government, education, health care, information technology, veterinary medicine, supply chain logistics, finance, energy sector, and not-for-profits. She specializes in credential development, learning solution development, and learning/knowledge infrastructures. Ms. Gander has significant experience working with international task forces and subject experts.

Crystal Gasell (crystal.gasell@ucdenver.edu), Academic Services Manager at CU Online, is a trainer, doctoral student, and educator. At CU Online, Crystal's primary focus is to expand the training and support programs offered to faculty and students at the University of Colorado—Denver. Additionally, she is a doctoral student at Boise State University with an interest in online faculty development and how faculty development impacts course quality and student success.

David Gibson Associate Professor (David.C.Gibson@curtin.edu.au) is Director of Learning Futures at Curtin University in Perth, Australia. He works as a thought leader, educational researcher, learning scientist, professor, and innovator. With funding from the Australian Office of Learning and Teaching, National Science Foundation, U.S. Department of Education, MacArthur Foundation, EDUCAUSE, and others, Gibson's research focuses on games and simulations in education, learning analytics, complex systems analysis, and the use of technology to personalize learning via cognitive modeling, design, and implementation. He has published 10 books, 15 chapters, and over 60 articles and presentations on these topics. He is the creator of simSchool, a classroom flight simulator for preparing educators, and eFolio, an online performance-based assessment system, and provides vision and sponsorship for Curtin University's Challenge, a mobile, game-based learning platform.

Ian Glover (i.glover@shu.ac.uk) has worked in the Technology Enhanced Learning field for over a decade, in various capacities at various UK universities. During this time, he has worked on projects ranging from small developments to enhance the practice of individual staff members to national and international projects aimed at identifying and promoting good practices. He joined Sheffield Hallam University in early 2013 and has worked on a number of significant projects, including raising awareness and supporting the piloting of Open Badges across the institution. He has been a member of the programme committee for the annual international conference of the UK's Association for Learning Technology (ALT-C) and has reviewed papers for journals in the field, including the MERLOT *Journal of Online Learning and Teaching* (JOLT) and *Computers & Education*. He holds a PhD in the development of online collaborative learning systems.

Pilar Carmina Gonzalez (pgonzalez@edc.org) is a researcher at EDC's Center for Children & Technology, where her main research interest is to help struggling students develop content-area literacy skills. She has worked on CCT research projects about social studies education, teacher professional development, early childhood education, educational video games, digital badges, and tablets in schools. She also worked for the Northeast and Islands Regional Education Laboratory (REL-NEI) at EDC, where she conducted research and technical assistance to help practitioners and policymakers translate education research into practice. Before that, she taught ESL for 5 years through the NYC Teaching Fellows program and worked as a research and policy intern at New Visions for Public Schools, a nonprofit school support and charter management organization.

Sheryl Grant (sheryl.grant@duke.edu) is director of badge research at the Humanities, Arts, Science, and Technology Alliance and Collaboratory (HASTAC), which administered the Badges for Lifelong Learning initiative, a competition that awarded over $4 million to 30 digital badge development projects and 10 research studies. Her book *What Counts as Learning: Open Badges for New Opportunities* is a synthesis of lessons learned from the first year of badge system design across 30 projects. Sheryl is completing her PhD dissertation at the University of North Carolina-Chapel Hill's School of Information & Library Science where her research focuses on badges, value sensitive design, and reputation systems. She also served as chair of the Badge Alliance's research working group.

Jordan Hamson-Utley (Jutley@usa.edu) is the program director and associate professor of the Master of Health Science Athletic Training program at the University of St. Augustine. She has also served as the Director of Teaching and Learning and as athletic training research faculty at Weber State University and two other institutions. Dr. Utley's educational background includes a PhD in Experimental Psychology/Psychology of Injury from DePaul University, an MS in Exercise Physiology from Northeastern Illinois University, and a Bachelor of Athletic Training from Minnesota State University, Mankato. Her lines of research include post-concussion holistic care of the athlete, the psychology of sport injury, psychosocial strategies for athletic trainers, and technology use in patient care. A current project includes utilizing the FitBit to gather baseline activity levels of healthy high school student athletes. She serves as the publishing chair of the National Athletic Trainers' Association's Professional Development Committee and is also a member of several professional organizations, including the National Athletic Trainers' Association (NATA), the Association for Applied Sport Psychology (AASP), and the American Psychological Association (APA).

Errin Heyman (eheyman@usa.edu) is a passionate and experienced educator, specializing in facilitation and assessment of student learning outcomes through faculty development and program/institutional review and assessment processes. She has 20 years of higher education experience, with extensive practical and theoretical knowledge of online pedagogy (she built and taught her first online course in 1996), on-ground curriculum and instruction, and accreditation processes and requirements, including online credit hour design and reporting, and WSCUC regional accreditation site visitor experience. She has taught face-to-face and online, and during her time with eCollege, she worked with hundreds of instructors on online pedagogical approaches. Dr. Heyman has presented at numerous conferences and is a member of the WSCUC Academic Resource Conference Steering Committee. She has graduated from the WSCUC Assessment Leadership Academy as well as the Online Learning Consortium's Institute for Engaging Leadership in Online Learning—where she was first introduced to the idea of utilizing digital badging for faculty development. She lives and works in Denver, Colorado, with her husband and two Manchester Terriers, and enjoys writing both academic-focused pieces and poetry/short stories.

Daniel T. Hickey (dthickey@indiana.edu) is a Professor of Learning Sciences and Research Scientist at the Center for Research on Learning and Technology at Indiana University. He uses design-based research methods and situative theories of cognition to improve learning and instruction. He focuses on "participatory" approaches to assessment, motivation, and credentialing, and work in e-learning, video games, open learning, and new media contexts. He is currently directing the Open Badges in Higher Education Project.

Alicia Holland is a University Lead Area Faculty Chair-Research and Dissertation Faculty. Each author is a published researcher.

Leah Irving (L.Irving@curtin.edu.au) is a Learning Engagement Developer at Curtin University in Perth Western Australia. Leah has extensive experience in learning and teaching, curriculum development, and technology integrated learning across all education sectors. Her current research examines how academics experience virtual worlds as pedagogical places through the lenses of embodiment, pedagogy, and place.

Rebecca C. Itow (rcitow@gmail.com) is a doctoral candidate in the Learning Sciences program at Indiana University and a researcher in Kim and Louis Gomez's *Improvement by Design Lab* at UCLA. She researches and designs participatory approaches to professional development, focusing on contemporary assessment practices and pedagogical techniques that support connected, networked learning in curricular designs. She works primarily in technology-rich, networked environments for both teachers and students. Rebecca also studies the implications of assessment practices in classrooms and open digital badge systems. Prior to joining the program at Indiana University, Rebecca taught high school English at a public high school in Southern California.

Keesa V. Johnson (keesavjohnson@gmail.com) is an award winning learning designer who has won an AT&T Instructional Design award as well as six American Advertising Awards for immersive course creation. She is a practitioner of design as well as a locally renowned children's play writer and director. "My life is about making visions come to life and everything I do to make this a reality is done through learning." Examples of Immersive Design courses: MSU Zombie Course, Black to the Future—The evolution of Black Studies, FoodFuturestrailer, and eSankofa—conversations about the black experience via canvas network. Keesa has a B.A. in Telecommunications with an emphasis in fine arts and is an avid learner with several specializations. She is an active member of EDUCAUSE Learning Initiative, Online Learning Consortium, Immersive Education, Open badging working group, as well as a signatory of the serious elearning manifesto. Her interests are in immersive environments (theater, film, digital technologies, mobile learning, augmented reality, simulations, and holograms), Humanism, Transdisciplinary and Immersive Design, Massive Open Online courses (MOOCS), Motivational Learning, and Choice theory.

Jelena Jovanović (jeljov@gmail.com) is an Associate Professor of Computer Science with the Department of Software Engineering, University of Belgrade, Belgrade, Serbia. Her current professional and research interests include semantic technologies, knowledge engineering, Social Semantic Web, technology-enhanced learning, applied machine intelligence, and learning analytics.

Mansureh Kebritchi is a University of Phoenix Research Chair in the Center for Educational and Instructional Technology Research (CEITR) School of Advanced Studies, University of Phoenix.

Erin Knight (erin@badgelabs.io) is an education technology executive and entrepreneur. She is the founder of the Open Badges movement, which is a new system for credentialing and accreditation, and for supporting broader learning across the Web and lifetimes. She wrote the initial white paper on badges that laid the foundation for the work to date, and led the development of the technical and social infrastructure through Mozilla. She founded and directed the Badge Alliance, a network of over a thousand organizations collaborating on building and growing an open badging ecosystem. She spearheaded the Chicago Summer of Learning and initial Cities of Learning work, and now leads the growing Maine State of Learning initiative. She currently runs Badge Labs, a product, services, and implementation firm focused on catalyzing a new culture of learning, identity, and hiring. Formerly, Erin ran an education technology research center at the University of California-Berkeley and worked for many years at Blackboard in the early days of online learning. She lives in Portland, Maine, with her kids and two chocolate labs.

Sunny Lee (sunny@badgelabs.io) is the Director of Product and Co-Founder at Badge Labs, an organization committed to catalyzing a new culture of learning, identity, and hiring through digital badging utilizing the open badges standard and technology. She serves as the Open Badges standard working group chair, steering and organizing the cabinet and working group to define development priorities in order to ensure the ongoing adoption and appropriate evolution of the standard. She was the Director of Infrastructure at Badge Alliance, comprised of a network of organizations focused on collaborating to build and grow an open badging ecosystem. She was one of the original founding members of the open badges initiative and team while at Mozilla and played a critical role in growing and catalyzing adoption of the standard and technology. She works tirelessly to promote open badges as a viable and evidence-based way to capture lifelong learning that can be used to evaluate learners for career and educational advancement and opportunities. Sunny has a Master of Information Management & Systems degree from UC Berkeley with an emphasis in Education & Technology.

Melinda J. Lewis (Melinda.Lewis@sydney.edu.au) works within the Education Portfolio at the University of Sydney and is a doctoral student at the Centre for Research on Learning and Innovation, The Faculty of Education & Social Work. Her work focusses on embedding cultural competence within curriculum and on the design and delivery of blended professional development for teaching cultural competence. Her research focuses on the relationships between teaching and research for health practitioner academics in research-intensive environments. Combining these roles she draws on social science theories regarding implied and actual identities, a cultural habitus and relational dispositions, ways of being and becoming.

Alison Lockley (alison.lockley@cdu.edu.au) has a Master of Education degree and a broad range of experience with e-learning, innovative educational technologies, and instructional design gained through 25 years in education-related roles. With a passion for social and game-based learning, Alison currently leads innovative online projects and is the Manager of the Innovative Media Production Studio for Charles Darwin University, Australia.

Jason M. Lodge, Ph.D. (jason.lodge@unimelb.edu.au) is a psychological scientist and Research Fellow in the Australian Research Council funded Science of Learning Research Centre and the Melbourne Centre for the Study of Higher Education, University of Melbourne. Jason's research concentrates on the application of the learning sciences to higher education. Specifically, he is interested in the cognitive and emotional factors that influence learning and behavior and how research findings from the learning sciences can be better used to enhance design for learning, teaching practice, and education policy. Jason is also interested in the ways technology is influencing learning, particularly in terms of the impact of technology on the development of professional ways of being, metacognition, critical thinking, and expertise.

Laura Lubin (llubin@fiu.edu) is an Instructional Designer at FIU Online in Miami, FL. She is currently pursuing her Ed. D. in Adult Education and Human Resources Development at Florida International University, looking at developing inclusive online spaces and creating relevant, aligned and personalized learning experiences. When not doing work related to Instructional Design or her dissertation—she is enjoying the Miami sunshine, on the beach!

Rudy McDaniel (rudy@ucf.eduwww.rudymcdaniel.com) is Associate Professor of Digital Media for the School of Visual Arts and Design at the University of Central Florida. His research focuses on digital badges, interactive storytelling, XML, and game-based learning. Rudy is co-author of *The Rhetorical Nature of*

XML: Constructing Knowledge in Networked Environments (Routledge, 2009). He has published his previous research in journals such as *PRESENCE: Teleoperators and Virtual Environments; The British Journal of Educational Technology; Educational Technology & Society;* the *Journal of Online Learning and Teaching*; *Technical Communication*; and *Information Systems Management*. He is co-principal investigator on the Charles Brockden Brown Electronic Archive and Scholarly Edition, a project funded by the National Endowment for the Humanities. Rudy has consulted on interactive projects for clients including the US Library of Congress, the IEEE Professional Communication Society, and the Canadian National Centres of Excellence. In addition, he has written video game scripts for the Federation of American Scientists and collaborated with personnel from the Walters Art Museum in Baltimore on the *Discover Babylon* learning game. He currently serves as Assistant Dean of Technology and Research for the College of Arts and Humanities and Director of the Texts and Technology doctoral program at UCF.

Bridget McGraw (info@bridgetmcgraw.com) , an independent consultant, lives and works in Oakland, California. In 2014 she helped Temescal Associates develop and implement the Center for Digital Badges, which aims to ensure that afterschool and summer youth initiatives and programs have the capacity to recognize learning by youth and adults where it happens. She is a founding member of the Committee on Digital Badges in Expanded Learning. Before turning to educational technology she trained as an artist at New York University and worked as a digital producer in Australia. She has lived and worked in London, Nairobi, and New York City in the nonprofit, educational, and corporate realms. Her experience includes roles such as project manager, technical advisor, educator, editor, and museum exhibition producer. In 2015 she started an educational enterprise called Thingfully, which will become a platform for "Internet of Things" lesson plans. Her formal education includes a BA in English Literature, an MA in Fine Art Photography, and an MPS in Interactive Telecommunications.

Elizabeth C. Metzger (Metzger metzgere@fiu.edu) is a Curriculum Consultant at FIU Online in Miami, FL. She has a strong technical understanding of enterprise level systems that support teaching and learning, which allows her to provide leadership and oversight in the area of educational technology and online learning. She has extensive experience at the secondary and adult level in professional development, curriculum design, and instructional technology including online and traditional pedagogy. She is currently pursuing her Ed. D. in Adult Education and Human Resources Development at Florida International University focusing on creating technology-rich, quality, online learning environments that foster authentic engagement and scholarly collaboration.

Nikola Milikić (nikola.milikic@gmail.com) is a Teaching Assistant and a PhD student at the Department of Software Engineering, Faculty of Organizational Sciences (FOS), University of Belgrade. His current professional and research interests include semantic technologies, Social Semantic Web, technology-enhanced learning, and learning analytics.

Timothy Newby (newby@purdue.edu) is a Professor in the Learning Design and Technology program area of the Department of Curriculum and Instruction at Purdue University. He conducts research on issues pertaining to motivation, human learning, instructional strategies, and the use of technology. In particular he is examining the impact of digital open badges on learning and motivation in post-secondary education. In his role as convener for the Learning Design and Technology program area, he led the effort to create and maintain the first fully online graduate program (LDT MSed). Newby teaches online, hybrid, and face-to-face undergraduate and graduate courses that include Introduction to Educational Technology; Instructional Strategies; Learning Theory, Motivation, and Foundations of Instructional Design Theory. He has published over 50 research articles and 16 books. His most recent texts include *Educational Technology for Teaching and Learning* and *Teaching and Learning with Microsoft Office*. He received his PhD in instructional psychology from Brigham Young University.

Sandra G. Nunn (sandynunn@email.phoenix.edu) As an ethics, leadership, and national security expert, she has appeared extensively in the national and international media, testified before the US Senate, and was also featured as a guest speaker at prestigious Smith College in Northampton, Massachusetts. In addition, she has served on the Board of Directors for an international public company as well as an international nonprofit organization. Currently, Dr. Nunn serves as an executive for two consulting firms and a green alternative energy firm. She also serves as a Board Member for several nonprofit organizations and as a Trustee for a private trust. She is a Founding Board Member and Director of International Ethics with the Foreign Affairs Council, Inc., a nonprofit organization that serves as an international platform for advancing knowledge and leadership. Further, Dr. Nunn is a Research Affiliate with the Center for Educational and Instructional Technology Research at the University of Phoenix where she collaborates on scholarly research and publishing endeavors regarding ethics, leadership, education, and technology. Dr. Nunn holds a Doctor of Management in Organizational Leadership, an MBA in Global Management, a BS in Electronics Engineering Technology, and an AA in General Studies. She is currently working on several books for future publication.

Aysenur Ozyer (aysenur.ozyer@ucdenver.edu) is a doctoral student, a graduate assistant, and an instructional technology specialist at the University of Colorado—Denver. Her research focuses on instructional technologies, online education, and professional learning and technology. She is currently working with faculty members to develop online courses. She is also working as an instructional technology specialist for a federal grant that offers online professional development for teachers.

Rochelle T. Patten (rtpatten@fiu.edu) is an academic advisor at the School of Journalism and Mass Communication and a part-time lecturer at the College of Architecture + The Arts at FIU in Miami, FL. She is currently pursuing an Ed. D. in Adult Education and Human Resources Development at Florida International University where she is focusing on the role that accent plays on career progression. She has extensive experience in higher education, student development, travel and tourism, and not-for-profit organizations. When not doing work she can be found doing kickboxing and Kung Fu at John Wai Kung Fu Academy.

Rebecca Sanders is University of Phoenix Dissertation Chair, Committee Member, and Associate Faculty and a freelance instructional designer.

Len Scrogan (len.scrogan@ucdenver.edu) A former teacher, principal, and technology director for the Boulder Valley Schools, Len Scrogan was named Outstanding Technology Administrator in the state of Colorado in 2009. Len is currently a Digital Learning Architect and author of *Digital Shapeshifter*, a book on creative visual teaching and learning. He is also a blogger, TEDx speaker, and recognized ed-tech author and speaker. He is a co-author of the American Optometric Association's seminal report on 3D in the classroom, See Well, Learn Well. Len serves as the online community manager for LinkedIn's Stereo 3D Media and Technology online community of 8000 members. He serves as a national judge for the Technology & Learning software awards and is currently a board member for the ISTE 3D Network, a member of the COSN Emerging Technologies Committee (co-author of the 2015 EdTechNext report *New Dimensions in Learning*), and a panelist on the 2015 Horizon Report.

Deborah West, B.A., M.S.W., Ph.D. Associate Professor (deborah.west@cdu.edu.au) is the Director, Learning and Teaching at Charles Darwin University, Australia. She has over 20 years of experience in Higher Education across several universities and has held a variety of roles during this time including lecturer in sociology and social work, departmental head of Social Work, Head of School of Health Science, and Associate Dean (Learning and Teaching). She has a strong track record of research, scholarship, and publication in the area of teaching and learning and the use of technology as well as in her substantive discipline of Social Work. Most recently, her focus has been on the role and impact of technology, and in particular learning analytics in the higher education sector.

Janelle Whyte (janelle.whyte@fiu.edu) is a graduate assistant at Florida International University working in Athletic Compliance. She is currently pursuing her Ed. D in Adult Education and Human Resources Development also at Florida International University. Her concentration is in Recreation & Sports Management where she will be focusing her dissertation on collegiate retirement and career development. When not doing work related to her studies, she loves having game nights with friends, training with FIU Boxing Club, and engaging in outdoor or fitness activities.

James E. Willis III (jaedwill@indiana.edu) is a research associate in the Center for Research on Learning and Technology in the School of Education at Indiana University. He was previously an educational assessment specialist in the Office of Institutional Research, Assessment, and Effectiveness at Purdue University. His research and publications include work on the ethics of learning analytics and digital badges, the intersection of automated technology and its potential ethical and educational implications, and the future of educational technology. He has presented on the futurity of massive open online courses through the lens of Foucault's heterotopia at MIT, published in EDUCAUSE Review Online, and presented research on digital badges in a number of educational venues. Educated in theology, philosophy, and comparative religion, he holds a Ph.D. from King's College London, an M.Litt. from the University of St. Andrews in Scotland, and a B.A. from Roanoke College in Virginia.

Cameron Wills (cwills@niu.edu) is the Research Associate at the Faculty Development and Instructional Design Center at Northern Illinois University. He holds a master's degree in Instructional Technology and is currently working toward his Ph.D. in Instructional Technology from NIU. His research interests include the integration of game-like elements into the design of instructional systems, developing digital badge ecosystems, and the promotion of self-managed learning environments.

Brent G. Wilson (brent.wilson@ucdenver.edu) is professor of Information and Learning Technologies at the University of Colorado Denver. A veteran scholar and observer in instructional design and technology, Brent's research focus is on foundations for practice and strengthening the ties between theory and practice. Key questions driving his work include: What is good instruction and how can we support its development and use? How can we help instructors and students to make appropriate use of learning technologies and resources? How can we create learning experiences that invite learners to truly engage at deep levels and potentially become transformative in their lives?

Casey Wright (caseyw@purdue.edu) is a Product Development Lead at Purdue University, where she earned a master's degree in Learning Design and Technology. She is part of the Studio by Purdue group that is reinventing the learning experience by creating innovative digital tools based on educational research and experimental design. At Purdue, she has the unique and rewarding opportunity to shape the future of student success by leading development projects, conducting research for Studio by Purdue's suite of learning tools, and using research results to inform and guide development of the tools. The team's work has been featured by the New York Times, USA Today, CNET, and The Chronicle of Higher Education; and has won awards from Wharton-QS Stars Awards 2014: Reimagine Education, Center for Digital Education, TechPoint Mira Technology Awards, and Campus Technology.

Ying Xie (yxie@niu.edu) is an Assistant Professor at Northern Illinois University. She earned her Ph.D. in Instructional Systems from Penn State University. Her current research focuses on the integration of emerging technologies and creation of cognitive tools to promote reflective thinking, higher-order learning, and knowledge construction.

Part I
Theoretical Foundation of Digital Badges

Chapter 1
Digital Badges and Micro-credentials: Historical Overview, Motivational Aspects, Issues, and Challenges

Larry E. Ellis, Sandra G. Nunn, and John T. Avella

Abstract The use of symbols in ancient times to reflect different meanings has evolved into modern day usage of digital badges and micro-credentials to indicate achievements, knowledge, skills, and competencies. This article explores the historical overview, motivational aspects, issues, and challenges of digital badges and micro-credentials to provide insight and clarity into the various uses and functions in the modern world. The historical perspective of symbols will be presented, and the historical use of both traditional and digital badges will be defined. In addition, this essay provides current research and literature that focuses on the theoretical foundations and human theories that support badging as well as empirical evidence of digital badge utilization. The discussion will explore fields where traditional badging is prevalent and digital badging has limited use such as industry, business, sports, education, entertainment, and peer group programs. Finally, this essay explores the changes due to technology infusion and the theory of disruptive innovation due to the explosion of technology within the last 50 years, current digital badging, and the future of digital badging.

Keywords Digital badges • Micro-credentials • Open badging • Open systems technology • Performance validation

L.E. Ellis (✉) • S.G. Nunn • J.T. Avella
University of Phoenix, Phoenix, AZ, USA
e-mail: docdistance7@email.phoenix.edu

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1 Evolution of Symbols

1.1 Original Purposes

From hieroglyphics to barcodes, symbols have been a shorthand method used for communicating all types of information for many thousands of years. Some of the earliest symbols used by humanity exist in caves in Europe and are believed to be somewhere between 10,000 and 20,000 years old (Bailey, 2008). The paintings in these caves portrayed great hunters in the middle of their kills; therefore, these paintings represented a kind of symbol or badge of accomplishment. Symbols have played key roles in the lives of individuals, groups, and organizations throughout the world. They have identified kingdoms and birthrights through heraldry, organizations, and services. For example, McDonalds and Kelly Services use trademarks. Groups such as the Masons and the Scouts use logos. Each symbol has its own connotative and denotative meanings based on how the individual perceives it. The meaning of symbols is influenced by extrinsic conditions like the place, time, culture, the actual graphic structure of the symbol, and the peer group involved. In addition, it is influenced by intrinsic conditions like the individual's background, experiences, age, and condition. Further, meaning can be influenced relative to the contextual use and any bias the individual may have developed personally or indirectly in discussion with significant others (Womack, 2005). Initially, the symbol was a direct representation of the event itself; however, over time the meaning of the symbol changed even though the physical representation may or may not have changed. The development of the open badge concept represents the result of the evolution of symbolism. While symbols convey meaning based on experience or learning, the open badge allows changes, more comprehensive meaning, and the ability to update meaning based on changes to the field or topical area.

Between 10,000 B.C. and 4000 B.C., there was little progress in the development and use of symbols. However, some believe that this time in human history was when people moved from a prehistoric existence to a modern man environment (Bailey, 2008). When the new era of humanity began, the different civilizations throughout the world contributed in their way to the advancement of the number, type, and use of symbols. This expanded use was not without its problems, however. One of the issues with the cross-cultural use of symbols that existed early on is still an issue today as the world feels the impact of globalization on non-verbal communications and specifically symbolism. Symbols can take many forms including badges, unique awards, trophies, certificates, credentials, plaques, pictures, clothing, and jewelry. Symbols can stand for or suggest something else by relationship, association, convention, or accidental resemblance, which can derive from an individual or group of individuals based on their personal perceptions and experiences (Bailey, 2008). The value of a symbol depends on an individual's personal perception of it, which then impacts the desirability of having or not having it. Initially a problem, it has been shown that the desirability can be manipulated positively or negatively by understanding and using different motivation theories.

Initially, many organizations and functions used symbols and badges in their operations. These symbols were designed not for the individual but rather to satisfy the internal or external needs of the organization. As a result, organizations were concerned about what meaning or value the users gave to the symbols. Most of the interpretation dealt with extrinsic tangibles. The organization identified the symbols with values that had meaning to them such as a certified technician. In this scenario, the organization could easily find a technician when the group needed certain skill sets. While an employee viewed the certification as an opportunity for greater income or to earn a promotion, the organization viewed the certification as a means to identify skill sets needed for the benefit of the organization. Very little attention, if any, was paid to what individuals thought about the symbol, how desirable it was to them, and what caused the individual to feel the way he or she felt about the symbol or badge. Examples of that approach exist in the military and business. If the military needed to identify someone who they knew had certain skill sets or needed to be identified quickly in an emergency for delegation of responsibility or for providing direction, they provided a specific rank and a symbol of that rank for their purposes. If an organization needed to identify a valuable customer, it would confer a certain status such as a club member, a special certificate, or a unique designation to show that a different relationship was needed when interacting with the customer.

1.2 Development of Human Theories That Explain Badging

The success of badging depends on three factors: motivation, pedagogy, and credentialing (Ahn, Pellicone, & Butler, 2014). Motivation may represent the common link to all elements that relate to the effectiveness of a digital badging program. Further, pedagogy is defined as methods, techniques, theories, or approaches to teaching as well as learning (Pember, 2008). Credentialing is a process used to verify that an individual or organization has met certain defined standards established by a group charged with creating and implementing these standards (Styles, 1999). Credentialing includes some mandatory and voluntary processes. Therefore, credentialing may involve licensing or certification requirements. Organizations, programs, and individuals seek credentialing as evidence of their ability to meet any formally established standards (Dickerson, 2012).

Because motivation is a key factor in many aspects of badging, it is important to understand what motivation is and its significance in badging. Over the last two centuries, individuals explored what motivation is as well as its absence or presence through the use of different theoretical constructs. These included Maslow's Hierarchy of Human Needs, Herzberg's Two Factor Theory, McClelland's Acquired Needs Theory, Adams' Equity Theory, Vroom's Expectancy Theory, and Keller's ARCS motivational model (Ebert & Griffin, 2015; Huett, Moller, Young, Bray, & Huett, 2008; Kreitner & Cassidy, 2011). The result was five groups of motivational theories of motivation with a common thread.

The first four groups focused on some form of internalized causes for behavior, which an individual could manipulate partially. The fifth group known as Humanistic Theory represented a philosophy that learning represents an individual act undertaken to fulfill personal potential (Benson, 2007). Woolfolk (2008) wrote that humanistic interpretations surrounding intrinsic-based motivation emphasized self-actualization taken from Maslow (1968), actualizing tendency taken from Rogers and Freiberg (1994), and self-determination from Deci, Vallerand, Pelletier, and Ryan (1991). The theories in the Humanistic group focused on two types of questions relating to motivation: (a) why do individuals do the things they do and (b) how are individuals motivated to do them. Maslow in his Hierarchy of Human Needs (Kreitner & Cassidy, 2011) identified the why in his five levels need structure that all individuals experience. Keller's ARCS theory approached motivation based on how individuals can achieve motivational states (Huett et al., 2008). Also, his ARCS theory attempted the synthesis of behavioral, cognitive, and affective theoretical constructs to show how individuals' intrinsic motivation can be impacted by extrinsic conditions (Moller, 1993). It is important to note that it is not extrinsic motivation but external *conditions*. The other identified human theories fell between Maslow and Keller's approaches.

Motivation can be internal (intrinsic) or external (extrinsic). Understanding the similarities and differences is important to begin to understand how symbols and badges can create motivation. Intrinsic motivations represent attitudes or drivers extending beyond the satisfaction of mere physiological and security needs, which are the basic levels prescribed by Maslow. Maslow's two highest level needs, known as esteem needs and self-actualization needs, are those that provoke intrinsic motivation (Becchetti, Castriota, & Tortia, 2013). Deci (1975) noted that one is considered intrinsically motivated when he or she receives no reward other than the activity itself. Alternately, extrinsic motivation is where behavior is driven by outcomes or external factors that are not unique to the individual (Robinson et al., 2012).

Motivation, whether internal or external, can be regarded as a collective group of several influential factors rather than as a single force (Deci & Ryan, 1985). Therefore, individuals involved in creating digital badges should understand motivation as well as the basic principles of how and why symbols motivate people. For example, individuals are motivated by other individuals to fulfill the need for belonging (extrinsic). In the past, people joined specialized clubs, groups, clans, and professions that had unique symbols. People worked to wear that symbol to create the image of personal importance and success. Badges and other similar indicators of performance, learning, membership, and rank work because they fulfill human needs like belonging, growth, and accomplishment. Though badges may appear to be physically identical in shape or name, badges take on meanings based on their function and implementation (Abramovich, Schunn, & Higashi, 2013; Antin & Churchill, 2011).

As people implement a new program, they create symbols for program participants to create a desire to belong to the group. The evolution of badge development has followed a dichotomy that involved either (a) modifying existing badges and symbols to reflect changes, or (b) creating totally new badges to support new organizations or activities not previously in existence. Every situation that involves an individual or organization continues to need some form of symbolic representation. History provides a comparative basis to show how digital badging can change the use of symbols. History can also reveal why changing to the concepts involved with open digital badging can significantly improve learning and its understanding.

2 Historical Usage

A comparison of the definitions of a traditional badge and a digital badge can help facilitate understanding of these two concepts of badging. A traditional badge can be defined according to its tangible make-up (e.g. metal, plastic, paper, wood, glass, etc.) and what function it serves (e.g. to show authority, to show completion of an activity, etc.). As a unique type of symbol, badges have long been a product in the creation, evolution, and modification of human behavior (Halavais, 2012). Badges can carry out a wide variety of functions and purposes. Traditional badges are often graphic representations of what it is that the badge represents. For example, a scout merit badge has a symbolic graphic of what the topic of the badge is. A law enforcement badge is usually in the form of a star, which is a symbol of enforcement. Digital badges exist in a different state or condition; thus, they possess a unique definition.

Janzow (2014) defined a digital badge as “a digital representation of a learning outcome. It could represent a certification, a credential, a competency, or a soft skill” (p. 9). Ford, Izumi, Lottes, and Richardson (2015) described a digital badge as “merely a visual representation of an earner’s achievement, skill, or disposition” (p. 32). Badges consist of digital representations of logos or icons shown on a website or another online page (Educause, 2012). They are a new way to capture and communicate what an individual knows and can demonstrate (Finkelstein, Knight, & Manning, 2013). Digital badges can signify the accomplishment of an objective such as reading a book, creating a product, participation on a team, touring a foreign country, publishing an article, teaching a seminar, or rebuilding a car engine. In the past, badges were named by an organization and tied to the group but there was no way to identify and track significant learning. However, open badging and credentialing allow for the clear identification and tracking of the skills and knowledge required to earn a badge. This hard data can be expanded unlike previous physical badges or symbols that represented static information. Further, use of this technology allows people to store, track, and communicate with digital badges and credentials. In the historical context, symbolism has placed a role in communications and understanding mankind’s existence; whereas, badging has become an extension of that symbolism.

The fields described in the next section represent areas where traditional badging exists in various forms, but digital badging does not except for education. Programs are still being tested and evaluated in limited target areas. However, these fields represent areas where researchers should explore the use of digital badging.

2.1 Industry

In the past, individuals received awards for reaching important goals in the workplace. These included personal safety goals, exceeding base production standards, achieving a lower work rejection rate, completing specialized training, completing years of service, or raising money for charity. Acknowledgments for these milestones came in the form of pins, certificates, gift certificates, and special titles of recognition. These awards focused on what the individual could do for the organization and its shareholders. Similarly, badging may hold potential in these circumstances. Dudek, Gamret, Peck, and Zimmerman (2014) posited that digital badging had implications for meeting the needs of employers and workers through personalization in workplace learning and by summarizing individual achievement using digital badging. Gibson, Ostashewski, Flintoff, Grant, and Knight (2015) stated "digital badges have the potential to become an alternative credentialing system, providing visible recognition in digital symbols that link directly via metadata to validating evidence of educational achievements in public displays." (p. 403). While there is no formal activity with digital badges currently being tested or evaluated in the workplace, digital badging could support activities currently performed on a manual basis.

2.2 Business

Research reveals that business is a fertile area for expanding digital badging. Antin and Churchill (2011) indicate that badging is an emergent process in which more research is required. With the movement of staff, technologists, and management across various organizations, understanding individual abilities and capabilities within needed functions will not only enhance productivity but will also improve hiring efficiencies, and potentially reduce turnover. Adams and DeFleur (2006) found that employees who earn digital badges might be valuable to managers. Also, badging appears to enhance employee engagement and professional development (Educause, 2014). These insights demonstrate implications for a business setting focusing on achievement, growth, and incentives. Businesses spend a portion of their budgets on training and schooling as well as on acknowledgments. Digital badging would help keep track of this ongoing developmental activity in a manner that is easily understood and followed. Badging activity is underway in the areas of business education such as the Mozilla Project. However, digital badging could support activities currently done manually. Olneck (2012) identified important badge features like the ability to identify knowledge and skills as well as the usefulness of badges in the context of credential inflation. He also concluded that badges serve as an alternative to prior dominant forms of credentials.

2.3 Sports

Sports programs provide a somewhat different perspective on the use of badging. The scope and variety of sports available to people have exploded in the past 50 years. Different organized sports programs involve children and extend into programs that involve sports-minded adults. Sports programs not only provide trophies to participants and winners, but they also offer certificates, t-shirts, and pins as proof of participation. More formalized sports in schools and club teams generate plaques, ribbons, certificates, name awards, and scholarships. Additionally, many organizations and schools offer learning and performance camps that issue trophies and certificates for a variety of outcomes. While professional sports have two kinds of participants (e.g., players and fans), players are the only ones who have formal awards. Fans very seldom receive any acknowledgment other than a thank you letter to a season ticket holder. However, the advent of open badging provides clubs the opportunity to develop more ways to acknowledge fans and communicate with each professional realm. At the lower levels of usage such as in developmental sports programs like the YMCA, elementary school, and middle school, the open badge is more of a "gold star" representation. For example, the digital badges offered by the YMCA in New York to improve teen fitness allow users the opportunity to earn merit badges based on performance (YMCANYC, 2015). Similarly, other badges offer recognition for achieving personal sports goals.

2.4 Education

The field of education has been one of the primary users of symbols and badging beginning with diplomas and degrees as well as specialized regalia. Additionally, honorary fraternities and organizations provide certifications and designations for high GPAs. Educators also publish to maintain their jobs. Teachers write books, develop new classes, do research on new concepts, and work on team projects. All of these result in the issuance of some acknowledgment on a resume that the teacher must build. In education, an instructor may design and create an online class but get no credit for it. Further, an employee may work to complete a team-based project; however, no acknowledgment exists to show how the experience and practice enhanced the individual's capabilities. Instead, the acknowledgment shows what the person accomplished but not how they achieved these endeavors. Further, issues regarding meaning may not be addressed. For example, individuals who complete an MBA program can show that achievement and a GPA. In such a case, an MBA graduate could be great at concepts but have no practical experience; whereas, another MBA graduate may possess real world experience with each topic in the curriculum. Open badging could provide an easy way to capture all formal and informal learning experiences and make this information available to anyone who had access to the digital badging database. Use of badging could motivate learners. For example, Abramovich et al. (2013) found that learner motivation might drive the act of earning badges. Further, he determined that systems that used badges could result in positive effects on learners' motivational influences. They further implicated that when designing badges, designers must consider the abilities and motivations of learners. However, some observers tout that open badge systems might also lessen the actual learning experience rather than enhance it (Young, 2012). Therefore, it is necessary to achieve a balance between the educational experience and ancillary learning outside of a formal classroom.

2.5 Entertainment

Individuals who entertain in different professions (e.g. dancing, acting, singing, broadcasting, writing, etc.) get special titles, trophies, plaques, and certificates. Likewise, individuals who complete support activities for the entertainment industry also get credit for activities like costuming, music, screenplays, choreography, scenery, composing stories, music, and other creative, non-performance activities. Most of those acknowledgments come in the form of movie credits on screen and self-generated resumes. Open badging presents a way for all people to view a central point of information about what they did, what they learned, how well they performed certain activities, and any training or certifications earned (Gibson et al., 2015). Again, there is no formal activity with digital badges currently being tested or evaluated. However, digital badging would support activities currently done manually.

2.6 Group Programs

Affiliation groups are groups that people join on a voluntary basis for specific objectives and purposes. These groups include Boy and Girl Scouts, Masons, Lion's Clubs, social and scholastic fraternities, church groups, and civic organizations. The Boy and Girl Scouts provide actual merit and rank badges as well as certificates. The other organizations provide certificates and special plaques based on service and involvement. With the national average of a family moving every 3–4 years, taking important memberships into other states can present a problem. Open badging solves the problem with its ability to save badges and all relevant information attached to the badge through the capture of its metadata. The use of metadata eliminates a problem of individuals having to reinstate membership with the organization at the new location.

Every organization has specific awards and acknowledgments regardless of specialty location, size, or membership. But they also have people who perform tasks for the organization for which no acknowledgment exists. This unrewarded activity may improve the individual's knowledge, skills, and abilities through active participation, reading, or planning. Frederiksen (2013) noted that current badging approaches identify the activity by topic; however, they do not capture the important details of how many symbols with the same name may have completely contrary meanings and results. It is these contextually-defined experiences that separate proposed open digital badging from traditional symbols and make digital badging such a major step forward in learning and communicating potential.

Badging acknowledges an individual for an accomplishment that records may not reveal. The information stays with the organization and lasts as long as the individual is an employee or member of the organization. Each item exists in isolation from the others. The individual can carry home the award or certificate and may add the name of the award to the resume. However, unless others know about the award or achievement, there is no way for a potential new employer or admissions board to ascertain what the awards encompassed. The digital badge provides new potential for all involved. Finkelstein et al. (2013) noted that digital badging provides lifelong recognition, decentralizes credential granting, recognizes prior learning, provides mobility across the field of the same and different endeavors, recognizes achievement, and acknowledges new achievements and assessments. Joseph (2012) noted that digital badging could create the scaffolding of classes to create advanced, higher order results as well as specific career paths.

3 Digital Badging in a Changing World

3.1 Technology

No industry has changed more significantly than technology in the past 50 years. Nowhere is the effect called *disruptive innovation* more evident. Christensen (2015) defined *disruptive innovation* as "a process by which a product or service takes root initially in simple applications at the bottom of a market and then relentlessly moves up market, eventually displacing established competitors" (para. 1). But the application of new information tracking control technology and storage has expanded the potential for badging in much the same way online capabilities expanded delivery of learning to rural areas, single student environments, home-based students, and global populations. The use of badging technology offers businesses worldwide the opportunity to evaluate a potential employee in terms not only of the resume or the cover letter but also based on a more objective and thorough method of identifying skill sets and experiences. Badging allows for explanation and discussion of what static names or titles mean. Organizations that once had to test, evaluate, and monitor employees can now have a way of ensuring what an employee can do before hiring him or her. It will break down cultural, geographical, and organizational boundaries for employees, students, and teachers because what once were nebulous terms can be well defined and documented in many different ways. It's possible to create records, establish and distribute standardized guidelines, and control the integrity of a system created as the result of disruptive innovation. Information about what an individual has learned can be stored, sent around the world instantly, and assessed according to the meta-information embedded in the badge (Janzow, 2014).

The impending pressure to continue attracting and retaining students as a source of income and reputation is forcing changes in the education sector. The changes initially will have a larger effect for those who are not benefiting from the current roles of post-secondary education. As the values and benefits of the ever-improving higher education system become clear, learners will advocate for widespread changes across the nation (Christensen & Horn, 2011).

The technology is available for digital badging as shown by the various projects now underway. As technology evolves through innovation, additional applications for digital badging may emerge. This is consistent with various concepts of disruptive innovation. However, the changes in applications are also unexplored. As one area expands and develops, it triggers a change in the other; therefore, a self-sustaining creative reaction is created that develops faster than can be validated by experience. Also, other companies and governments outside of the U.S. have been looking at different uses of digital badging that may differ from the U.S. primarily because these users may not have the same technological resources or high-level needs.

3.2 Globalization

Globalization had already become a reality far in advance of full implementation of open digital badging, so it is not something new but rather another adaptation of efforts to optimize the impact of reaching out to other countries. As more diverse, inter-country teams are put together virtually to resolve problems that belong to multiple countries, it will become important for people in the US to know what skill sets, backgrounds, and experiences mean in other countries. Conversely, teams from other countries will need to know the same information about US-based teams to help organizers make a good match of human resources from all countries involved. There is no predominant factor or need beyond that of understanding.

The use of open badges with standardized metadata significantly improves individual mobility across disciplines, companies, governments, and countries as more organizations assume a global posture. Unlike the badges and awards used in other countries, open badges provide much more needed information to make decisions about the use or application of human resources. Janzow (2014) identified a metadata template that included eight components. These components consisted of the achievement name, achievement description, issuer background information, and issuing criteria used to measure a recipient's qualifications. Also, the template included evidence to show a recipient's qualifications, links to external standards about the achievement, badge dates (e.g., issuance, expiration), and keyword tags. Fontichiaro and Elkordy (2013) identified three other components to include learner objectives, specified tasks, and how level-related badges provided prerequisites for the next level. Using this approach could support the development of the meta-badge, a badge that an individual can achieve by earning different badges (Beattie, 2014). The completion of the badges results in the creation of a badge hierarchy and the generation of a meta-badge to signify high achievement (Myllymäki & Hakala, 2014). Using this type of foundation, the meta-badge could replace traditional university degrees with digital degrees or nanodegrees.

In contrast to advanced countries with more developed digital badging programs, many countries are not yet fully capable of identifying skills, abilities, knowledge, and experiences because of different socio-cultural priorities, lack of centralized systems, and underdeveloped technology. One solution involves providing a system that is open and usable to those countries that may lack the technology to get their programs started. Adoption of cross-cultural programs usable worldwide would make the badging process available more quickly. Through this process, users could gain knowledge into badging processes. These insights would assist in identifying and implementing applications aligned with the needs of the country.

3.3 Mobility

One of the benefits of the digital badging system is that of mobility. Often, employees must abandon 10 or 15 years' worth of education, training, and experiences with an organization when the employee moves to a new place of employment. However, the digital badging program allows the individual to take all of his or her experiences, training, certifications, skill set information, and awards with him or her. Digital badging makes the individual more mobile and helps the acquiring company to know what the new employee can do. Digital badges would prove helpful in determining how well an employee works and what additional work or training needs to be undertaken to make the employee productive in the new position.

3.4 Evolving Needs and Technology

As previously stated, digital badges can provide a lifetime record of learning, evidence of readiness, job fit, special equipment usage, and unique experiences (Fontichiaro & Elkordy, 2013). However, as technology evolves and needs change, new opportunities to use digital badges may emerge. Because of innovation, digital badges could also demonstrate entirely new technology than what the current digital badging environment uses in current systems. The key will be to remain open to changing paradigms and how it could evolve in the future.

3.5 Problems

Issues with digital badging are coming from within the badge ecosystem. The issues involve the learner making decisions about the value of the badge to him or her as well as someone making the operational decisions regarding what information badges will contain and the tracking of badges. Other issues of concern involve who will handle storing and updating the information as well as who will handle the infrastructure to keep and display the badges (Foster, 2013). Besides the design and creation mechanics, the full implementation and use of the open system will require creating, redefining, or eliminating many basic concepts and beliefs about learning. Several issues for the field involve the acceptance that legitimate learning can occur outside the traditional education system (Randall, Harrison, & West, 2013) and an agreement on exactly what constitutes evidence of learning (Fontichiaro & Elkordy, 2013). For the individual earning the digital badge, a core issue is the value problem. In effect, one must consider which of all the similar digital badges earned will provide the greatest value to individuals (Kim, 2015). A concern by detractors is the potential for disruptive innovations that might result in a shift in the open system concept after committing the necessary funds and resources to make the system functional (Christensen, Horn, & Johnson, 2011). Because the actual work in completing a task, assignment, or objective is not observed or validated, it can be impossible to prove who completed the requirements. This revelation creates a trust issue on the value of the badge and the system, which subsequently may affect who chooses to participate and who doesn't (Educause, 2012). However, newer developments in the digital badging environment are helping to mitigate this issue. Certain resources are becoming available to help verify and validate badges, such as the website https://badgecheck.io and other similar sites.

At some point in the process, the amount of data and the activity will reach a point where they will need to be audited and controlled. To accomplish this task requires additional staff, training, and control processes that another organization unrelated to the issuing or displaying organization must perform. In that same area, badges are not universally accepted by all organizations because they don't know the rigor required to earn the badge. However, development of a rubric could help delineate criteria and competencies. Further, some groups may not accept the credentials of the organization awarding the badge and how well the person did even with a metadata link. Additionally, even with the metadata, it is possible that ultimate users such as individuals and organizations will interpret the value of the badge and use it in different ways. In one organization, their badge may be significant but in another organization the same badge will have little value (Ahn et al., 2014). What happens if there is a legitimate difference of opinion about what a badge should include? Who is the arbitrator? Where does the arbitrator obtain authority? What happens if the system is infected or is shown to be wrong? These questions warrant consideration.

Because the learner possesses a degree of freedom for documenting and completing the badge, there is a concern about identifying how well a student did. Though the badge issuer bears the ultimate responsibility for determination of badge completion, students could view the completion of objectives in different ways. If there is a list of things to do, the person might have skipped one or did not do well on another. In a classroom, a degree or certificate does not tell what classes a student studied or how the student performed in each class. The same degree at a traditional school on the east coast is not likely to include or even mean the same things as an online degree from another college.

4 New Considerations of Badging

New considerations such as validation of a digital badge will depend on the determination of what functions the badge is designed to perform. These functions may include pre-learning, meta-learning, cognitive learning, guideposts for planning, and assessments. Each badge, based on its function, will be validated differently. Validation could involve many people such as knowledge experts (instructors), applications specialists (real world knowledge practitioners), a curriculum designer, a career planner, a trainer, and an assessment specialist (Ahn et al., 2014). Because these credentials demonstrate a new approach to the learning paradigm, different people must assist in helping to determine what constitutes learning evidence compared to the traditional educational system. For this reason, the badge could easily be compared to a recipe. If one ingredient is wrong, the dish will not work. Therefore, understanding how badging and its applications work will help in the change process as well as mitigate potential actions by detractors who may seek to downplay the role of badging.

4.1 New Items

As digital badging technology matures and better applications emerge through innovation, developers are discovering and evaluating new uses for badging. For example, some badges could provide profitable applications while others may provide a foundation for changes that could impact a larger framework. Uses may involve changes to existing processes or they could be the focal point of a totally new or revolutionary function. While new items often fail at doing what they were created to do, they also can fill a current or future need. Often the use of new technology or application creates needs for new items that only exist because of using new programs. Digital badging may replace existing structures, may create new ones, or may make an existing process more efficient. For example, **o**ne area that represents the potential for significant changes is in education. “Some advocates are working to replace the traditional college degree entirely, creating a new system of badges that recognize educational achievement both inside and outside the classroom” (Briggs, 2013, para. 7).

4.2 New Programs

When an organization commits to a digital badging program, questions about new and different uses arise. As more information is made available about existing programs as well as how they are being developed and utilized, more questions will be generated about what to do in the future for different functions. Therefore, growth in new programs must be considered. For example, project staffing will need to evaluate the capabilities of the infrastructure for future development and expansion. Further, the cost to implement changes becomes a consideration. As new information becomes available from organizations experimenting with digital badging, questions are asked that identify possible new uses for the technology.

Less obvious uses can become readily apparent in virtually any field such as for sports. For example, fans of a particular team can be rewarded for continuous purchases of season tickets or of participation in special team offers. Players and teams may be able to use the system to track performances and create new data for metrics programs. Therefore, levels of recognition in team and league requirements could be tracked and documented publicly by issuing badges. It could make it possible to complete interleague comparisons.

The potential for improving communications about people using industry, league, or discipline standardizations could increase productivity in hiring employees, accepting enrollments in various programs such as college acceptance, and various job assessments like matching skills to new classes of jobs. Badges would link completed functions, skills, and other requirements for programs like entrance exams, certifications, and creating new jobs based on technology or need changes. Further, usage would not exhibit cultural or geographical constraints.

4.3 Failed Programs

Ample evidence reveals that unvalued badges routinely fail. For example, programs regarding redundant physical badge systems such as those with the Boy Scouts and Girl Scouts or those with duplicate systems fail to succeed in long-term efforts. However, failure of new programs is an inherent risk given newer technology. It can come from varied sources. Some failure results from unreal expectations, limitations of technology, immature applications, lack of understanding, passive or active resistance, and from trying to fit a new approach into an existing framework or condition. Technological issues will arise as people attempt to use existing hardware and systems infrastructures to save money and time rather than focus on innovative processes to reduce costs and implementation time. The result of a failed program is often suspension or abandoning efforts because of timing, skill, capability, or cost issues. Regardless of the final status of the effort, the innovator gains information that should be captured for future consideration when conditions and requirements change or when peoples' attitudes change. Badging innovation efforts are no different. What appears to be a failure at the time might be the link needed in a future effort.

4.4 Low Impact Programs

Divided usage among companies and extended organizations could become common. Alternatively, divided usage could also occur on a smaller scale in organizations that have a single function. Close tracking of activities and participants would improve organizational efficiency as well as enlarge the market for the organization. However, this would have to be balanced with ethical considerations because of the fine line inherent in employee monitoring and technical surveillance. Notwithstanding, the impact would be relatively small in other situations such as having a professional sports organization keep track of all its prize winners or season ticketholders. It could also improve medical services by more carefully and completely tracking all services rather than relying on the patient's memory.

4.5 Cultural Driven Foreign Programs

As globalization continues to expand into emerging economies, digital badging could prove useful to individuals and organizations as they seek to modernize and evolve in a rapidly changing economic environment. Through the use of digital badging, individuals could expand their knowledge to achieve higher levels of competency and skills as part of the emerging workforce. Organizations could adopt the use of digital badging to assist in the hiring, training, and promotion process of employees. By using this system, organizations could identify employee competencies to achieve higher levels of innovation and competitiveness in the global economic system.

5 Digital Badging Today

5.1 Discussion on Current Digital Badging Program

The innovation and concept of digital badging may be considered impractical in some applications. Digital badges are somewhat unwieldy at this time primarily because of the lack of experience defining, creating, and utilizing them. When online learning emerged as a viable learning environment, the old curriculum and lesson plan for the class was just dropped into the online infrastructure (Palloff & Pratt, 2001; Rice, 2014). However, that approach proved unsuccessful leading some opponents to argue that online learning didn't work. Badging can't just replicate sticker charts, which rely on extrinsic motivation. Without careful design and construction, digital badges could become a digitized "do it just to earn it" approach. In effect, "badge-grubbing" will become the reason for getting involved in earning digital badges (Fontichiaro, 2014).

The mission of universities will be changing from gatekeepers of knowledge to innovators and leaders of knowledge. Due to the need for accessibility and keeping track of constantly increasing information, the learner no longer needs a university to obtain information (Wolfe & Andrews, 2014). Changes have to be made to keep higher education relevant in the information age. Christensen and Horn (2011) have warned that the current business model characterizing higher education in America is outdated and no longer viable. Challenges from escalating tuition, declining endowments and government funding, and the immediate access to highly credible information require changes in the system. These changes will cause higher education to meet the needs of the students, the communities, and stakeholders (Christensen & Horn, 2011).

5.2 The Future of Badging

A great deal of work has already been completed to evaluate and develop digital badging systems. Programs like Mozilla Open Badge Framework (Ahn et al., 2014), Massachusetts Institute of Technology (MITx), Khan Academy, and the Joint Educational Project at USC represent examples of a small number of the programs being developed and used nationally and internationally. More experimentation is expected and, as more results are accrued and evaluated, many more changes will be considered. Researchers and developers engaged in working with digital badge technology will need to determine what processes work best within the framework of different disciplines and how to optimize the use of digital badges for all stakeholders. While this remains a challenging prospect, badging also holds great promise for the future because of the many uses and applications.

This exploration of the history of badging noted that symbolism is a form of communication that has been a tool of mankind for more than 20,000 years and has evolved to parallel the needs of people. With the advent of new technology, new programs are available that make badges more meaningful and effective for virtually everyone. The new baseline program called open digital badging allows users to design how the use of badges can meet the needs of humanity in the twenty-first century. As with most changes of this magnitude, principles, philosophies, beliefs, and attitudes that have existed for decades and even centuries are being challenged. There is no doubt that open badging can work. It is now a matter of determining if the benefits will demonstrate acceptance. The current picture will change. Therefore, it will be interesting to see what the evolutionary process brings in the future. “Digital badges are gaining traction and are no longer considered a technology of the future” (Foster, 2013, p. 30). Certainly, digital badging already demonstrates many possible applications in today’s world.

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Chapter 2
A Philosophy of Open Digital Badges

James E. Willis III, Kim Flintoff, and Bridget McGraw

Abstract One of the most promising educational technology tools, open digital badges, is quickly changing curricula, job acquisition, and workforce credentialing. Learning data, assessments, and expert validation made accessible in social media create a transparency that may well be suited for critical questions in education. Operating from a framework of establishing how badges are currently employed in learning—the influential contexts of individuals and communities, and data aggregation—raises questions concerning the roles of instructors, badge providers, and learning management systems. This "philosophy" of digital badges addresses a variety of epistemological concerns including the intersection of challenges to conventional educational motivation, suggestions of how Platonic and modern models of education are complementary, and implications of how badges may represent postmodern credentialing systems. These concerns are framed around understanding how current work in digital badges can feasibly transform learning; this is both an acknowledgment of how badges are beginning to change ecosystems of informal and formal learning as well as an attempt to demonstrate how an epistemological philosophy of badges can change educators' thinking and accelerate innovation.

Keywords Philosophy • Evidence • Epistemology • Learning • Democratic education • Knowledge

1 An Epistemology of Badges: Philosophy and Evidence

A demonstrable sense of "knowledge" in a multi-media infused, Internet-connected society may well present a number of challenges to its educational technology. Indeed, an emphasis on "…a conception of design epistemology that is not divorced

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J.E. Willis III (✉)
Indiana University, Bloomington, IN, USA
e-mail: jaedwill@indiana.edu

K. Flintoff
Curtin University, Bentley, WA, Australia

B. McGraw
Thingfully, Oakland, CA, USA

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from traditional epistemology, but one that emphasizes the dynamic, social, and creative aspects of knowing and knowledge construction" (Tsai, Chai, Wong, Hong, & Tan, 2013, p. 82) rightly positions knowledge and *critical evidence* of that knowledge in a natural tension. Open digital badges, functioning as a micro-credentialing system of sharable digital artifacts adhering to an accepted Open Badge Infrastructure-compliant (OBI) architecture, present a promise and a challenge to institutions privileging exclusivity of education, credentials, and evidence of learning. Though now several years removed from their introduction into the wider digital spectrum of available educational technology tools, and perhaps still several years prior to extensive adoption, badges are located at a critical epistemological juncture. This means that questions related to the future of badging practices, how badges intersect with business practices and education, and what functions are related to learner motivation and evidence are of importance.

Knight (2012) considers some of the limited thinking that surrounds badging discussions and posits that while badges and badge systems are not a solution in and of themselves, they do offer a significant contribution to an evolving ecosystem around credentialing, learning, teaching, and assessment. Knight warns of applying too much attention to the badge itself; this should be a caveat to any potential implementation of badging systems in education that a quality deployment focuses upon the learning design and evidence of learning rather than the badge that represents the learning. As Duncan (2011) explains, "Badges can help speed the shift from credentials that simply measure seat time, to ones that more accurately measure competency. We must accelerate that transition. And, badges can help account for formal and informal learning in a variety of settings" (para. 13). Perhaps this function of badges, as a social driver for transformation in education, offers a framework for discussing the elements that are emerging and the directions that are flagging potential for change while acknowledging the journey thus far. What sorts of changes are possible and what modifications in our thinking about badges are likely to "press the accelerator"? Such knowledge-driven questions help situate a *philosophy of badges*, or in the simplest sense, a way to think about how badges might transform learning.

Three themes help situate the context of a philosophy of badges, drawn directly from current and on-going discussions in educational technology and digital badges. These include challenging paradigms of educational motivation, examining badges as a business practice, and proposing how badging culture informs deeper analysis. These themes are epistemologically contextualized with an intersection of ancient wisdom and modern educational practice, concluding with a postmodern approach to digital badges.

2 (Re)Framing an Ecosystem: Challenging Motivation

As the trajectory of educational technology development continues to arc upward, so, too, that of badges in their many uses. One of those uses is motivation: Goldberg (2012) discusses the links between viewing badging systems as almost exclusively motivational tools (generally predicated upon a cautious suspicion that they posit the motivation extrinsically). Goldberg proposes that badges can be seen as way-points, or mechanisms for mapping progress and providing a platform for reaching out to new possibilities, effectively extending learning. Further, Goldberg asserts that badges are not intrinsically “behavioral lures,” that the design and implementation of the system issuing the badges is where expectation setting will occur.

The goal of reframing badge use from an extrinsic, and educationally negative (Abramovich, Schunn, & Higashi, 2013), “I want a badge” orientation towards a more intrinsic and critically informed “I want to present evidence of my learning and growth” should be a priority in any educational deployment. One report of the perception of badge use within a MOOC suggests that many learners find some enjoyment in being able to earn badges and valued the motivational aspect in terms of how badges assisted with “keeping on track” (Lokuge, Gregory, Salmon, & Pechenkina, 2014, p. 124). While the extrinsic motivation to learn and the use of badges more in tracking the progression of learning amidst the complex demands of modern life are seen to be complementary, what is not discussed is whether or not the badges were perceived as some form of formative or summative feedback.

Other recent studies (Cucchiara, Giglio, Persico, & Raffaghelli, 2014; Gamrat, Zimmerman, Dudek, & Peck, 2014) indicate that learners sometimes co-opt the use of badges to create their own personalized timetables and pathways for learning. The data systems that support badge issuance and acquisition often gamify the learning process; arguably, the concern here is not the use of markers of progress, but rather a concern with *who* decides on the learning pathways. If the badges are framed as dangling carrots that the teacher strategically positions to lure the learner through an externally motivated set of actions, then he/she is not offering much more than a token reward system. If, however, the learner has access to the data and can construct his/her own pathway, then the shift is towards a more intrinsically-defined motivation.

Such a pathway has important design implications for badges; epistemologically, the question shifts from how a learner may be compelled to learn with an incentive to how learning becomes deeply embedded in notions like individual freedom. Pathways themselves take on important implications of how knowledge is constructed, amalgamated, and synthesized in mapping.

2.1 Mapping Knowledge Through Badges: Beyond Motivation

Ingold (2005) considers mapping and way-making processes that are expressions of the experiential dimension of traversing a space. Ingold considers the process of way-making as an act of “coming into being” along lines that are “winding and irregular, yet comprehensively entangled into a close-knit tissue” (p. 47). In similar ways, the process of acquiring and collecting badges could be seen as a mapping process and the coming into being is a parallel of developing knowledge, skill, and capability. Ingold goes on to discuss external processes as a form of “occupation” and Flintoff (2007) blogged about teachers as colonizers (occupiers) of learners’ spaces. Questions arise about how teachers can provide badging opportunities that support learner autonomy and self-direction rather than excising student experience. Perhaps transparency of criteria and data holds the keys; the learner can construct or perhaps retrace the mapping he/she has already undertaken rather than simply rely on the reductive mapping of a teacher's previously installed markers.

Ingold also discusses the notion of "transport" in mapping—so that mapping is reduced to a series of known destinations and predetermined waypoints—whereas a true traveller (or active learner) engages in his/her own way-making and mapping processes through discovery and personal relevance. Can educational scholars conceive of badges in such a way that they elevate learning in formal contexts away from a simple transport system between prescribed learning outcomes?

Reflecting on game mechanics, the "gamification" of badging is not an end in itself. When engaged in desktop role-playing games like *Dungeons and Dragons*, the mapping of territory can facilitate a richer engagement in the game and create opportunities for discovery and review. Open-ended games like *Dungeons and Dragons* are similar to the open-endedness of a lifelong learning path, and as such there are mechanisms that keep participants aligned to individual goals. By tracking, scoring, and accumulating new abilities, participants are able to extend the scope of the game, play with more experienced and nuanced player communities, and prepare themselves for changes in the ways the game is played. When participant maps are shared with other players, it facilitates collaboration, team building, and expanded opportunity. To focus on the scoring and mapping as some simple form of external behavior modification system is to denounce individual agency as a critically informed participant and to ignore the broader context of the role of participation.

Perhaps there are ways to shift from this parallel of an education system being a transport system that can potentially remove the granularity of traversing a landscape towards something like Korzybski's (2005) notion that "the map is not the territory" (p. 750). To stretch the metaphor to education, the territory is the total experience of living and travelling across an educational landscape that has far more richness and relevance to the traveller than simply the symbolic reduction that is offered by a map. The map is useful and bears some similarity to the territory but is necessarily partial and distorted. How can a badging system accommodate a better representation of the territory? According to Halavais (2012a), "Badges, if done badly, just become another commodity; a replacement of authentic learning with an [sic] powerful image" (para. 18).

Poorly implemented badging systems also create an ethical (and possibly legal) quandary. Organizations that invite learners to engage with the promise of an achievement badge really must consider the implications of offering an essentially worthless, untrusted, or unrecognized marker of achievement. One of the key arguments for a standards-based open badging system is to mitigate against this type of damaging engagement. Internally, simple "motivational" badges and progress markers may be used in all sorts of ways to assist the learner, but when the badge becomes a credential then the issues of value, acceptance, and trust begin to arise.

The assumption that a learner's pursuit of a badge is its motivational strength takes a limited view of the possibilities; in fact, badges can be awarded without a learner having to pursue them. In a rich, authentic context for learning, the ability to "catch them doing it" is enhanced. In environments predicated upon experiential learning, the value of reflective practice is high. Novice learners are often unpracticed in reflection skills and this is maybe where badges can provide a capability to flag an experience. Formal contemplation can further prompt learners to review what they have just done by allowing them to "monitor their own learning process as well as provide a framework within which to compare and evaluate their goals and achievements with those of other participants" (Cucchiara et al., 2014, p. 141; Curran, 2014). This also suggests that beyond traditional motivational practices in education, an effective badge practice also acts as an intercessory "partner" alongside the learner, which can be of great value to educators who use badges for more than a mere prompt for action (or, in this case, reflection), and as an artifact after the learning is complete.

The latter, too, may also function as a different type of educational motivation. While a transcript may lead to and accompany a graduate into working life, it represents "completed" learning insofar as curricula demonstrates knowledge. Badges, however, may readily "travel" with an individual across social media platforms, job applications, and educational experiences, perhaps even prompting the individual to pursue badge-driven re-certification, professional development, and additional learning that may not have been available without the badge. Thus, the chronologies of learning are directly repositioned with the use of badges. Where traditional paradigms of motivation may well urge action ahead of learning, and perhaps sustain learners, badges have the capacity to reach into the future for learning that is not yet available.

Such capacity to affect learning in terms of present and future digital artifacts also suggests questions of the reach of business. With learning evidence and the ability to continue learning, businesses may too have an important stake in how knowledge is shaped.

2.2 The Educational Enterprise and Communities of Learners: Badges as Business

As open digital badging becomes more mainstream practice in educational assessment and evidence-driven cultures of learning, the intersection of educational enterprise and communities of learners becomes increasingly relevant for institutions and individuals alike. In outcomes-based assessment in a so-called "knowledge economy," badges represent not only a form of credentialism, but also a currency to demonstrate marketable skills and abilities, at least in theory (Ahn, Pellicone, & Butler, 2014). Educational technology entrepreneurs are poised to capitalize on such shifts; for example, many private badge providers offer a "freemium" model of payment. Using OBI-compliant digital architecture, some companies allow users to build and issue badges, sometimes with limited functionality or numbers of recipients, for free (Lomas, 2013). As more functionality or more recipients are required, companies charge on a scaled rate. Such a business model is not unique to the educational enterprise, but it appears to be the most widely-used for badge companies currently.

Educational technology companies help learning in two distinct regards: learner-centrism and scalability. The former means that individual learners are empowered to take control of determining how their learning experiences can be validated and shared. The deeper sociological implication of this suggests that badges can alter what Michael Olneck refers to as a "regime" because they can reorient previously established hierarchies of instructor-student relationships (Olneck, 2015, p. 3). To the latter, badges contribute to the expansive reach of online learning, specifically with credentialing individuals with validated, sharable evidence. Like online learning, such systems can be scaled to the needs of a vast number of educational and professional development providers. Within existing "social structures" badges offer the possibility of critical engagement with educational frameworks such as learning, assessment, and achievement. Data liberation (Watters, 2012) becomes desirable in a culture where knowledge and information are valued and respected, and it also becomes achievable with an open data initiative. If educational thought leaders are truly interested in empowering learners with more than rhetoric, then framing a digital badge ecosystem as a personal data locker (Watters, 2012) becomes a viable strategy towards this intriguing ideal.

Ownership of the data that is embedded within a badging system is inherently linked to issues of trust, confidence, and ethics. Many proponents of digital badging in education assert the view that the ability of badge users to "filter, shuffle, sort, hide or display" (Fontichiaro & Elkordy, 2015, para. 8) contributes significant value to education and that when badge recipients (learners) have the capacity to shape the representation according to context they are empowered by the granularity and depth of evidence that they can control. Thinking about badges in the context of learning analytics and "student data" more broadly raises ethical questions around data usage. Who has the right to access, collect, manage, manipulate, and redistribute this data?

Potential problems that may affect learners include use of individual data for automation, re-ordering of credentialism, and recalculation of what autonomy means in a community of learners (Willis III, Quick, & Hickey, 2015). Badging companies, like other digital enterprises, generate and collect large amounts of potentially valuable data, both aggregated and individualized. There may be nothing unethical about culling and interpreting data to benefit future students (especially with transparent disclaimers and opting-in techniques), but as individual data becomes ever more commonplace, can the reliance on purported good intentions be sustained in practice? Data constitutes one of the most valuable assets in business in terms of monitoring, developing insights, strategic optimization, and, ultimately, monetization. This is normally conducted under some model of business intelligence. The personalization of service delivery almost necessitates using a client's data to inform operational decisions; in these contexts, privacy and trust issues seem to be paramount.

Similarly, as the regimes shift, the balance of knowledge and demonstrated competence has the potential to change greatly. For example, as competency-based education becomes *terra firma* in previously rigid educational structures, the need for individual assessment by an expert may be disseminated and automated to expand the validity of human agents. These developments may similarly affect how individuals relate to online communities, especially when such communities provide expert validation, socially-networked feedback about credentialism claims, and the transparency to secure jobs. Such autonomy within communities can turn into digital dependencies, of which companies may stand to profit.

Educators are increasingly able to access performance dashboards that display aggregated expressions, visualizations, results, and achievements related to student learning behaviors (Charleer, Santos, Klerkx, & Duval, 2014). Currently, many cloud-based software applications confined to the particular context in which the student-teacher relationship exists (school, university, etc.). Badges introduce the possibility of extending engagement to all aspects of a person's lifelong learning journey. It then becomes an ethical consideration as to whether or not students are properly informed about and aware of how such disclosures might be used by their teachers, school, university, and subsequently, future employers. It also raises the issue of whether or not teachers are adequately prepared to properly utilize the data that is available to them. Systems must begin to consider the responsibilities of data security and data management as a significant part of their organizational culture.

On one hand, teachers are charged with facilitating meaningful change in ability, belief, behavior, knowledge, and capacity of students, but they must balance this with a considered understanding of how and when the data provided by badging and other systems is within the scope of legitimate use. Current strategies employed by educators to bring about the expected changes in learners are not always transparent; assessment criteria, professional judgements, and learning design are often outside the scope of student awareness. Rich, open badging systems that properly and explicitly reflect the activity and achievement of recipients—particularly in alignment with transparent expectations and assessment criteria of issuers—have the potential to transparently render the mechanisms of teaching and learning.

Such claims, both positive and negative, are generally in the theoretical stage now, but the claims are not outlandish. The provocative question here is whether such innovation can be harnessed to benefit not only the companies themselves, but also (more significantly) the learners that could mutually benefit from such an evolution in digital micro-credentialing. The information provided in badges indeed has real value not only to badge companies, but also to those in the wider ecosystem of student-oriented artifacts like learning management systems, learning tools, and textbook cum content companies. Harnessing such data—and responsible use of it—becomes not only an abstract ethical concern, but also a commercial matter for those with a vested interest in promoting future hierarchies that promote learning and opportunities.

2.3 Badging Technology and Badging Culture

Fostering a learning culture where learners are predisposed to critical engagement is likely to diminish the perception of the badge as a desirable shiny thing and impact upon "critical learner motivations" (Abramovich et al., 2013, p. 217) and subsequently upon learning design more broadly by demanding greater adherence to constructive alignment of content, learning activities, and formative assessment tools (Cucchiara et al., 2014). Ito (2012) highlights the risks of over-dependency on technological solutions. Meaningful implementations of badges will simply reflect that a paradigm shift is occurring. The value of a badging system in education requires the establishment of trust and support across an ever-widening range of stakeholders involved. Educators have long questioned the quality of behavior that is the result of "incentivizing users to increase their activity" (Anderson, Huttenlocher, Kleinberg, & Leskovec, 2013, p. 104; Kohn, 1993) and yet token reward systems, praise, and other encouragements remain the basis of many learning engagement activities.

A badge carries metadata and has the potential to generate a far more expansive narrative than any individual element within a dataset. The technical specifications of the Mozilla Open Badge Initiative (Badges/Onboarding-Issuer, n.d.) describe how to "bake" a complex set of information used for validation and verification into what looks like a simple web-compatible PNG image. A badging system has the potential to identify when and where a person is engaged with learning, the attempts a learner has made, the outcome of those attempts, the relationship with the badge issuer, and much more. How readers of a badging profile interpret that narrative may be less transparent. As a result, a personalized badge collection has the potential to evolve into a significant indication of status. Social media profiles in personal and professional sites are already enabling the presentation of badges as social markers (Gibson, Ostashewski, Flintoff, Grant, & Knight, 2013).

Another common theme discussed in the debates around the value proposition of badges is the ability for badges to reflect the full scope of learning that anyone develops: "Digital badging recognizes learning and growth wherever it happens and helps people connect their accomplishments across institution types" (Fontichiaro & Elkordy, 2015, para. 5). It often goes without saying that while people have the potential to learn in every context of their lives, they often prioritize the formalized and certified contexts above the informal stuff of life. It is useful in a discussion of badges to explicitly reclaim the absences in acknowledgement of learning. Sullivan (2013) suggests that a digital badging system can enable the coding and recognition of learning across a broader learning ecosystem; by casting our net wider than the "traditional sites of learning" it is possible to "signal that any place can be a site for learning" (p. 5).

Reputation markers are arising in many online contexts; certainly in academic and professional sites like LinkedIn, ResearchGate, and others there are rudimentary endorsement systems that parallel badging systems. While there are many deficiencies with simply clicking to endorse a profile with a particular capability or attribute, it signals a move towards peer recognition and could become the basis of a more formalized system that asks the endorser to fill the evidence gap. Whether formal or implied there is a tendency towards a taxonomy of educational contexts. Universities and schools are ranked, private providers are subject to industry and consumer perceptions, and much informal learning is currently ignored or, at best, treated with caution. What could emerge is a more transparent articulation of how these taxonomies are constructed and maintained, who is assigning value, and what contexts shape these meta-referents. In this way, badge recipients may be better able to determine how to package their badge collection to optimize their value in different contexts.

Badges have the potential to become the currency of educational experience. It has been suggested that ownership of a badge or a combination of badges could signify levels of privilege and access by way of advanced standing comparable to recognizing prior learning and result in exemptions from tasks, signaling readiness for complexity and exchange for other badges (Fontichiaro & Elkordy, 2015). As badges gain value, the issuers are charged with greater responsibility for confidence in that value and will need to foster increasing levels of trust, transparency, and openness about the mechanisms that accommodated the award of the badge. The "enforcement mechanisms" (Halavais, 2012b, p. 370) needed to drive this charge are yet to be fully negotiated and are likely to draw upon emerging social contracts as much as technological and legislative solutions.

3 Epistemology: Some Badging Narratives

The highlighted contexts of digital badges, namely the intersection of education and motivation, business and data, and badge culture and technology, help situate the discourse within possible philosophical approaches to current and future badge thinking. The approach of selecting two different philosophical frames is not comprehensive, but is rather a suggestive framework for future work describing philosophical intersections with badges in particular and educational technology in general.

Badges stand at the forefront of current credentialing systems: they represent traditional modes of presenting learning evidence, but they also serve as a pointer to connected learning that can transcend informal and formal modalities. Thus, it is important to address how an alignment of ancient wisdom to modern views of education and a "postmodern" epistemological approach to digital badging lends new insight into how badges can be understood.

3.1 Badges, Democracy, and Plato: Connecting Ancient Education with Modern Practice

With the proliferation of digitally-connected learning tools, institutional control of educational curricula has been democratized with free or low-cost tools like YouTube, Khan Academy, MOOCs, and many others. Nussbaum argues that higher education (particularly in the United States) is "not simply pre-professional, but a general enrichment of and a cultivation of reasonable, deliberative democratic citizenship" (Nussbaum, 2002, p. 291). Could badges act as the glue in an increasingly interconnected global economy? Though Hanson (2007) points to the impossibility of moral neutrality when dealing with ideas, the OBI framework embodies democratic ethics that can facilitate innovation at an even a faster rate. Technological innovation fueled by the demographic ideals inherent in crowdsourcing such as Indiegogo and Kickstarter—and demonstrated by the rise in 3D printing, Maker spaces, and small-scale robotics—exhibits how projects like digital badging support and mirror the shift from the industrial age to what Anderson (2013) calls "desktop manufacturing" age.

While learning is now widely available online, formal credentialing still remains entrenched in traditional models of formal recognition. Badges may have a similar democratizing effect on the credentialing ecosystem, though. Such democratic ideals have familiar roots in Platonic thought because they bring together the power of education and human freedom. Some of Plato's thought, coupled with modern educational theorists, suggests how open digital badging and credentialing systems are becoming more closely aligned with broader access to education.

In a general sense, what unites ancient and modern educational practice is that of whole person formation. This means that connecting the intellectual, physical, spiritual, and emotional selves is important in the development of a person. Russell's essay "The Aims of Education" spells out that education cannot be ethically neutral. Russell clearly states, "We must have some conception of the kind of person we wish to produce, before we can have any definite opinion as to the education which we consider best" (Russell, 1927, p. 159). Though writing in a vastly different era from the twenty-first century model of education, Russell's insight applies across chronological and socio-psychological differences because the essence of human development endures.

The notion that education is a universal human right is a recent ideological development. The ancient Greeks did not value individual rights *per se*; the education of individuals was in the service of a greater common good, and—in the case of Plato—often described in the context of utopian civilizations. Plato posits, "… assuming that there are men good and useful to the community, it is not only knowledge that makes them so, but also right opinion, and neither of these comes by nature but both are acquired…" (Plato, 1956, pp. 154–155). Indeed, Plato argues through the mouthpiece of Socrates that knowledge is a *recovery* of what is already known in the individual soul (Plato, 1956). Though these theoretical, albeit morally-infused, visions of education persist today, by the time Dewey and Addams were advocating for inclusive education in the context of early twentieth-century industrial America, the pragmatic method (Lake, 2014) had taken root in the philosophy of education. Pragmatism did not usurp the Socratic-Platonic view of education, but rather situated the intended outcomes of responsible citizenship, moral responsibility, and the like to economic factors like job attainment. In contemporary educational culture, badges are essentially a pragmatic tool, as detailed by Lake in "Working With: Expanding and Integrating the Pragmatic Method for a Wicked

World." As a pragmatic tool, though, badges may also expand the Platonic notion of knowledge acquisition as an aesthetic ideal (Plato, 1982).

The milieu that surrounded and propelled Addams and Dewey at the turn of the twentieth century in Chicago has similarities to current socio-economic conditions; now, however, the ease of global communications allows growth and innovation to arise in virtual communities. Siegfried describes how Addams and the Hull House experiment "offered classes in art, music, drama, sculpture, philosophy, and literature to its immigrant neighbors" (Seigfried, 2007, p. 83). The immigrant learners were also industrial workers. Likewise, the OBI supports STEAM (Science, Technology, Engineering, Art, and Mathematics) initiatives that edify STEM (STEAM minus Art) learners in the twenty-first century. Addams' philosophy makes the "startling claim that we are responsible for choosing our experiences," (Seigfried, 2007, p. 85) which directly mirrors what could be named the mantra of the OBI project: "Pathways for Learning" (HASTAC, 2015). While the arguments for and against STEAM percolate, the social and economic reality of success stories in the Maker movement, which necessarily includes aesthetically pleasing design in order to succeed economically, trumps academic musings (Britton, 2014).

Nussbaum has championed traditional liberal arts education to prepare students for the increasingly global and "complex interlocking world" (Nussbaum, 2002, p. 292) of the twenty-first century. While not directly condemning the *de facto* career readiness focus of formal higher education institutions, Nussbaum express a strong conviction that higher education ought to enrich a person's humanity, thereby reinforcing the reasoning powers of a democratic citizenry. Nussbaum reminds her readers that Socrates' "examined life" not only bolsters a person's critical thinking skills but also develops enough defiance of thought to create an innovative populous: "Like a gadfly on the back of a noble but sluggish horse, he [Socrates] said, he was waking democracy up so that it would conduct its business in a more reflective and reasonable way" (Nussbaum, 2002, p. 293).

What is educationally epistemological, then, has an aesthetic quality to it; beauty becomes the measurement and the outcome. This may appear at first to be in contrast to the recently accepted Common Core Standards (Conley, 2014) in the United States because direct learning toward career readiness is exemplified at the expense of personal and physical development. For example, the Common Core State Standards Initiative makes no mention of music or physical education.

The commerce-centric view of education would likely prompt Plato to ask how America's youth can learn ethics and morality. However, badges operate in formal and informal educational spaces, so the complement of morality through democratic ideals like peer support, group projects, teammate cooperation, and completion, stands the possibility of recapitulating aesthetics through what is colloquially referred to as "soft skills."

More significantly, Plato would perhaps wonder if badges could be awarded to and certify youth in musical and physical pursuits. In Plato's *Republic*, the Philosopher-Kings received instruction in subjects that might be categorized today as language arts, mathematics, physical education, and music (Plato, 2000). Comparing America's contemporary assessment standards against ancient views, the Common Core is half empty. There is, however, great opportunity for badges to recognize and authenticate character-building activities outside of Common Core formal learning.

3.2 Bridging Plato and Modern Education: Badges as Conversation

For Plato, philosophy operates within a social network where teaching a single person does not suffice; the whole community must practice inquiry together. Similarly, badges operate within social digital networks when people share them with friends, employers, and institutions. Badges can create community around their usage and evidence-based sharing; additionally, they represent a political function insofar as they communicate claims of learning to others. The political function of badges creates a philosophical space for knowledge itself. For example, Plato's concept of *theoria* (or, contemplation) has to do with what is common rather than individual (Nightingale, 2004). Applied to badges, knowledge becomes decentralized and indicative of an entire educational ecosystem, or in other words, the collective knowledge demonstrable in digital emblems. This aligns with the Platonic idea that philosophical knowledge emerges in the individual soul thanks to the dialogue among people who share a given form of life and who are constantly in contact with each other (Plato, 1956). Further evidence of this would be Plato's documentation of Socrates' method of teaching: If targeted questioning can function as scaffolding upon which badge issuer and recipient develop and defend what is known, it can postulated that a digital badge can represent the earthly form of the Platonic form. Badges emerge from networks or systems of thought; as such, dialogue within a network is requisite to earn a badge.

Learners of all ages already participate in digitalized networks and communication systems via social media platforms like Facebook and Twitter, personal one-to-one applications such as text messaging, Snapchat, and email—all of which reside on mobile gadgets like smartphones and tablets. Open digital badges can be seen as another sort of digital conversation; instead of chronologically-limited applications, badges serve an archival function to formalize conversations that demonstrate learning. O'Byrne ruminates about Dewey and Friere's vision of schools as "the critical spaces where students could be empowered to interrogate and question social circumstances through the use of discourse about issues of high interest and relevance to their lives" (O'Byrne, 2014, p. 103). School is no longer a physical space only; the disembodied virtual spaces of a learner's digital life are the location of contemporary Socratic dialogue. It is entirely possible to integrate the ancient wisdom of Socratic questioning, Platonic aesthetics, and modern technology within the structure of open digital badges.

For example, Goldstein (2014) situates Plato directly in the concerns of the modern academy and technology in *Plato at the Googleplex*. On stage at the 92nd Street Y in New York City, Plato, billed as the "best-selling author of *The Republic*," diplomatically mediates between a “warrior mother” who advocates extrinsic motivation and a psychoanalyst who perceives academic grading as a “quick fix of achievement… pursued not for the sake of the excellent work achieved, but rather for the sake of being *regarded* as excellent, whether there is true excellence there or not” (Goldstein, 2014, p. 179). Plato (channeled through Goldstein) says, when directly asked about how he detects potential in a child, that “mere intelligence without mettle makes for a feeble material” (Goldstein, 2014, p. 193) and that he looks for *thumos*, the Greek word often translated as “boldness” (Gay, 1988, p. 259). He continues, “You cannot change human nature. You can only change the polis so that what it potentially dangerous is rendered innocuous or even, in the best-ordered society, beneficial” (Goldstein, 2014, p. 194). Contradicting yet empathizing with the psychoanalyst’s fears about Plato’s “hegemonic vision of reality” (Goldstein, 2014, p. 190), Plato offers an empathic yet conciliatory pronouncement: “Those who lack this vital spiritedness will never do much harm in the world, it is true, but they will not do much good either” (Goldstein, 2014, p. 194). The power of badges, then, is the bridging between the boldness of knowledge and assertion of excellence and the evidence to support such claims. The creation of dialogue, of communication between educational claim and demonstration, helps instantiate the Socratic-Platonic method of teaching and learning with the technological reality of modern-day badges.

3.3 Digital Badges and Postmodern Credentialing System(s)

The mid-to-late twentieth-century philosopher Lyotard offered perhaps the most succinct definition of “postmodern” when he posited the “incredulity toward metanarratives” (1979, p. xxiv). Applied to the narratives of credentialism, digital badges may well be a postmodernist advancement against the metanarratives of a collegiate education and the culturally perceived value of that credential.

In knowledge-based economies, higher education becomes the gateway into social mobility, financial security, and advancement within workplaces. Further, education functions beyond the gateway because it signals the credentials of an individual. Universities, then, contain the narrative of educational attainment and potentiality for economic prosperity. Badges usurp this narrative in a variety of ways: From distributing traditional power structures of credentialism, to rerouting pathways to job attainment and advancement, badges are creating a new currency of educational power in domains like stackable credentials and competency-based education. The narrative established in codified evidence, held in perpetuity by the institution of graduation and distributed only by the alumni, remains dominant and prominent. However, the emergence of digital micro-credentials, held in perpetuity as an open learning artifact and consumed by no one and everyone, is quickly becoming an alternative means to demonstrate knowledge. The badge, therefore, becomes the apparatus of democratization that could well reform education in the coming decades.

In this emerging economy of credentialism, the value of a badge will hinge on the credibility of the issuer, the robustness of the evidence, and the direct applicability to rewards, advancements, or privileges earned by the learners. This credibility does not go far enough, though, because it operates in the same structures of the traditional transcript: A certificate of completion (albeit degree, professional development, etc.), validated exactly the same way, becomes no more than a token to substantiate a claim to learning in the modular scale. Rather, an effectual claim to reform is not only in the evidence, but also in the mechanisms of history, specifically aligned with the practical application of Foucault's "archaeology" and Derrida's "archive."

Foucault's terminology of "archaeology" allowed him to write history from the perspective of traces that constitute elaborate matrices of structures; in other words, history is not some flat presentation of events, but the strange curvature of processes that constitute a living structure of knowledge (Foucault, 2002). Applied specifically to badges, the "archaeology" presented as discursive claims to empirical knowledge can be re-written as the series of processes that form a totality of human learning. In other words, the transcripts of prior learning indicate the aggregated claims of understanding as delineated by some sort of evaluation; badges, however, can bypass conventional grading and instead show evidence of engagement, creations that challenge accepted norms, and other demonstrations of mastery over small domains. Coupled together, such small domains form an innovative way of writing the history of individual learning, and therefore the "archaeology" of what might be claimed as knowledge.

Similarly, Derrida also viewed history, or the possibility of history, with skepticism. His critique of history perhaps reached its apex in the comfort of the archive. Rather than a place that can embody the totality of known-ness of something, the archive instead serves as a sort of false awareness of the confines of what is epistemologically possible. Derrida was deeply skeptical of the ability to catalogue, sort, and organize any body of knowledge; thus, the archive becomes a place of paradox between the claim to embodied totality of knowledge and the evidence of incompleteness (Derrida, 1996). Applied to badges, skepticism of traditional transcripts, as a closed archive where learning is "complete" and embodied in some other credential like a degree, can lead to new ways of conceiving of the so-called "lifelong" learning and modularity of education. Instead of being a closed-off system of learning, badges can defy the possibility of archiving and solidifying knowledge and instead open it to improving opportunities and leveling to push the outer limits of personal capability. Rather than a specific summation of one's educational attainment, badges instead represent a continuum of accomplishments. In their incompleteness, granularity, and openness, badges are a digital form of Derrida's hesitation to capture knowledge in some form of finiteness.

As technology changes, so too will forms of credentialing. It may well be that badges are but a first step into a larger project of democratizing education. Viewed through a postmodern lens, badges demonstrate a possible future as well as a critique of the traditional values of educational attainment. Open digital badges stand as a reminder that knowledge is not easily suspended within a confined space; rather, it shifts and changes.

4 Conclusions

Open digital badges are a key component in the changing systems of education, credentialing, and evidence of learning. While the potential for perpetual influence is currently theoretical, badges have already exposed rapidly-changing demands for micro-credentials and curricular modularization, free or low-cost access to educational materials, and development of newer frameworks like competency-based education. To make sense of these changing systems, as well as to test the underpinnings of the technological development, establishing a philosophy within a particular context is necessary. The "problem" that unites technology and education is that of epistemology, or how it can be known that learning is occurring, that evidence supports claims of learning, and that badges are influencing other areas of education. Open digital badges, then, can serve to bring together the philosophical and empirical aspects of education in climates of innovative change. While traversing digital social networks, signaling claims and evidence of learning, badges can also challenge the barriers of static curricula by opening new pathways to continuous learning. The empirical evidence presented in and by badges, namely criteria, claims, and perhaps even professional endorsement, allow for the measurement of impact within social networks; such measurement also creates frameworks of knowledge helpful in philosophical discourse. As individuals' credentials and workplace needs become increasingly global and inter-connected, the philosophical approach to (re)thinking the signaling of individual and collective abilities places badges in the middle of both empirical and philosophical measurement.

An epistemology of open digital badges addresses several pressing concerns currently in the broader dialogue. Often cited as a means to increase educational motivation, an epistemological approach helps address and challenge assertions that badges gamify learning. Within the larger narratives of education, badges help re-establish a democratized agenda to learning; by connecting badging efforts to ancient Platonic views of education, modern practices like re-evaluating outcomes within aesthetics demonstrates alternative value systems to education. Finally, a postmodern approach to badges shows how traditional power structures of educational attainment might be better conceived through a continuum of ongoing learning efforts.

Instead of the long-prescribed route of higher education as a gateway and a pathway to career possibilities, open digital badges may present a viable and visible demarcation of usurping the power structures of education. Rather than a totality of knowable evidence of learning, badges are a means to show how learning within quickly-changing educational and credentialing systems is both critical of some contemporary practices and affirmative of an aspiration for future educational opportunities.

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Chapter 3
Keep Calm and Credential on: Linking Learning, Life and Work Practices in a Complex World

Melinda J. Lewis and Jason M. Lodge

Abstract This chapter will discuss the ideas and aims of higher education and the needs of the sector to continually innovate to meet workforce changes and labour market demands. The place of micro-credentials and open badges as approaches to locate, measure and validate learning within the academy are discussed. The affordances of technologies to map learning intentions and graduate outcomes of bodies of knowledge, skills-based tasks, and values acquisition at various levels of granularity are raised. The imperative to link learning, life and work practices for continued professional development and growth are highlighted. However, we raise cautionary tales about the use of competency-based approaches within the complexity of developing higher-order professional capabilities that require knowledge synthesis, abstract and novel ways of being, and the crafting of professional dispositions and identities through ongoing reflexive processes. Our key principle suggests that curriculum designs aimed to link ways of knowing, being, doing and valuing with ways of being practical in the world are important for life and professional practices. Finally, we suggest hopeful ways to keep calm and reflect on current approaches to digital badges and micro-credentialing acknowledging the many complexities of preparing professionals for practice.

Keywords Complexity • Accreditation • Professional ways of knowing • Being • Doing and valuing

M.J. Lewis (✉)
The University of Sydney, Sydney, NSW, Australia
e-mail: Melinda.Lewis@sydney.edu.au

J.M. Lodge
University of Melbourne, Parkville, VIC, Australia

D. Ifenthaler et al. (eds.), *Foundation of Digital Badges and Micro-Credentials*,
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1 Introduction

University education for beginner professional practitioners is not only about accumulating discrete sets of skills and knowledge (Barnett, 1997, 2009) but historically about linking ways of knowing with ways of being, doing and valuing (van Manen, 1977). Another essential component of a well-rounded graduate is the ability to learn through inquiry and critique, and from a range of experiences, where possible. Here we borrow John Dewey's metaphor, life *is* education (Dewey, 1938) where contemporary learning occurs in a myriad of ways, settings, contexts, places and spaces. Digital badges and micro-credentials provide great opportunities for recognising content acquisition and certifying skills and knowledge (Gibson, Ostashewski, Flintoff, Grant, & Knight, 2013), however the latter capabilities may be more challenging to locate, map and validate for students, teachers and accrediting bodies. From this premise, the affordances provided by a range of educational technologies and other mechanisms to allow for potential employers to also verify that candidates are suitably skilled and knowledgeable for roles and types of work enables a more seamless transition from knowledge-based educational environments to employment. The inherent tensions between badging actual as well as more implied (and developmental) capabilities poses issues for the approaches that may or may not be adopted within a measured society.

Despite this increased need to verify skills and knowledge and the potential to be able to build more robust assurances about such competencies and capabilities of university graduates in particular, several hurdles limit micro-credentials and badges from becoming accepted by employers and professional accrediting bodies (Jovanovic & Devedzic, 2014). Among the primary concerns of these groups are that a collection of compartmentalised competencies does not necessarily mean that an individual can synthesise across these competencies and engage in higher-level evaluation and higher-order synthesis required for addressing professional issues (Dall'Alba, 2009). These problems allude to the difficulty of fragmented learning towards the development of students as professional practitioners (Eraut, 2009). This is an issue that has also been prevalent in the wake of discussions around the ongoing role of massive open online courses (MOOCs) moving into professional content areas in higher education (Lodge & Lewis, 2015). Our final point picks up on current debates about the increasing use of measurement systems on complex learning operations in higher education. Do we build micro-measurement indicators for a range of micro-competencies and then craft ways to integrate the data on professional learning? Is this the anathema to the development of a more holistic and integrated approach to professional practices? What role may technologies play in such crafting: be it through the development of sophisticated metrics and indicators, the harvesting of often de-contextualised data requiring interpretation to better understand student learning?

This chapter will delve into these epistemological and ontological opportunities and challenges facing the use of digital badges and micro-credentials in higher education as preparation for professional contexts and what this approach may tell us about how we use, manage and manipulate data in higher education. We take as a starting point an integrated view of practice theory for professional development by Boud and Hager (2012), who critique that acquiring certain knowledge and skills and then transferring them in the real world does not work so well anymore. We work through the structural elements underpinning the need for an integrated body of knowledge, skills and values required for professional practice preferring an emphasis on the cultivation of professional autonomy and agency. Furthermore, we do not shy away from over-simplification of the individual, the unique and diverse nature of professional learning, and practices that make for richer and potentially innovative ways of being. In analysing these structures, we will highlight the most fruitful positioning of digital badges and micro-credentials within a broader epistemological perspective. We conclude with a set of strategies to allow for the integration of micro-credentials and badges into coherent and synthesised bodies of professional knowledge.

1.1 Micro-credentials in Higher Education

Notwithstanding the increased need to verify a range of knowledge-based skills as discussed above, there are numerous issues with the current state of higher education that call into question the traditional structure of the degree program (Bates & Sangra, 2011). While this is particularly true of liberal arts programs (Roth, 2014), there has been discussion about the suitability of degree programs and indeed of university education more broadly. There are several reasons for this. Firstly, it is clear that technology is fundamentally changing the relationship between knowledge and work, which has profound implications for higher education (Laurillard, 2002). Declarative knowledge is now readily available via myriad devices with the trend towards integration of these devices into every facet of daily life showing no signs of slowing. Secondly, the traditional broad undergraduate higher education has been supplanted by a more vocational focus with many disciplines and fields moving from work-based training, the vocational sector into higher education requiring degrees as entry to work or a right to practice professionally. As a result of these trends, in combination with the increased marketization of higher education globally, there is sufficient impetus for rethinking the traditional university degree and the balance of vocational and liberal foci. How to achieve this has however remained a topic of some conjecture with no clear path to resolving the complications associated with such a shift away from the traditional model of higher education.

After decades of a more vocational trend in higher education through undergraduate degree programs and right to practice graduate entry master programs, current trends across at least three of the predominant eight research universities in Australia are challenging the disciplinary breadth of vocational degrees, preferring to renew curriculum efforts and offer degrees with a stronger focus on breadth of knowledge. These trends mentioned above create conditions that require a rethink of university education, and a robust discussion on the place of smaller, more focussed credentialing of graduates leaving the university. A graduate may in fact be too knowledgeable but in an overly theoretical and abstract way (Litchfield, Frawley, & Nettleton, 2010) or they may be better able to manage complexity and uncertainty but unable to be pragmatic about workplace demands. In particular, employers are increasingly demanding that graduates align with the culture of an organization (Cubiks, 2013), a requirement that is near impossible for universities to meet given the diverse and amorphous nature of organizational cultures (Robbins, Judge, Millett, & Boyle, 2014). While cultural ‘fit’ might be difficult to quantify in any meaningful way, it might be possible to quantify other aspects of work readiness. Within this context, there is some sense in developing credentials at the smaller level of granularity. For example, if an individual can use a particular computer programming language, it will be of interest to prospective employers to know specifically what language it is, to what level of detail the graduate can currently function with it, and what their further potentiality may be.

Is this reflective of changes to work roles in the modern knowledge-based society? In general, work and learning are becoming increasingly complex, requiring a diverse set of skills. Both are seeing changes to what and how we work, with a sharper focus on recognizing and utilizing socio-material contexts to understand practice (Fenwick, 2012). This is perhaps no more evident than in higher education itself, where faculty are increasingly being required to develop more sophisticated pedagogical knowledge and technical skills perhaps not required under the previous (and largely now outdated) lecture/tutorial/laboratory model (Laurillard, 2002). With the increasing use of educational and other technologies to support curriculum aims, we see a blurring between the once distinct social structures of higher education on one hand, and the use of material things on the other. This situation is symptomatic of the increasingly complicated demands placed on graduates when they enter the workforce.

Employers broadly are looking for a range of quantifiable skills that will allow graduates and employees to quickly get underway on projects or other work activities, often within a socially situated context. Which style of degree, mode of delivery, assessment and feedback mechanisms would provide sufficient guarantee that graduates have the requisite skills in the evolving labour market? What combination of degree offerings across the range of higher education providers may be able to meet current and perceived labour market trends? In what ways can the more granular credentialing through badges, for example, lead towards fostering reflective learning and professional identities for individuals and groups?

1.2 Credentialing Professionals

Micro-credentials and digital badges may be seen to fill a gap between the stated and desired outcomes within a broad undergraduate degree and the skills, knowledge and competencies that employers are seeking in graduates. The question remains however as to where micro-credentials and digital badges fit within a broader higher education ecosystem. Can a sub-set of micro-credentials be cobbled together to create a program of study that will effectively prepare graduates for professional practice? Are micro-credentials and digital badges a way of up-skilling parallel to and beyond the degree, or will they eventually go part of the way to replacing it? If these skills are predominantly procedural in nature, how do they co-exist with vocational qualifications? While these questions will no doubt resolve in time, currently there remains some uncertainty about how micro-credentials will contribute to the preparation of both professionals and educated citizens of society (see also Craig, 2015).

By definition, professionals are employed to do knowledge-based work that is more deeply rooted in a theory-practice-reflexive dialogic than that expected for example of a tradesperson. Competency-based credentialism is a fundamental aspect of the recognition of practice-based trades and those holding similar vocational qualifications. A trade, in many respects, can be seen as a collection of competencies that are signed off over the course of an apprenticeship or traineeship. Given the compartmentalised nature of these qualifications and the lack of any need for a comprehensive underpinning theoretical framework, micro-credentials seem to be appropriate for this context. A trade qualified chef for example could provide evidence of competence in different cuisines, in baking, pastry cooking, managing the affairs of a commercial kitchen, etc. The combining of a set of competencies in this way, on the surface at least, would appear not to be viable when the point of university education is to develop a broad and deep understanding across and within a body of disciplinary knowledge. This is particularly so when this disciplinary knowledge is to be applied in a professional context into an unknown future.

The apparent disconnect between the notion of competencies and the purpose of higher education as a mechanism for educating professionals has been problematic for some decades. The increasing cost of a higher education globally has led to increased demand from students that their higher education will lead to employment as a professional. The credential therefore becomes the ticket for professional practice rather than a step in what is a lifelong journey to becoming a proficient professional practitioner. In this regard the very nature of the degree program could be considered to have shifted from the beginning of a larger journey to becoming a professional to a threshold, a barrier that, once crossed, leads to a competent and work-ready professional. Herein lies a fundamental shift in the purpose of a degree and the aspects, whether they be epistemological or administrative that exist within a degree program.

The greater focus on professional as competent on graduation is at least partly driven by accrediting bodies as well as the companies and industries that employ graduates. A sharper focus on the threshold created at the conferral of a degree, and away from the notion that post-secondary education is a much longer journey, is doubtless due to the increased influence of professional and industry bodies that have a financial stake in aspects of the profession. The result is an extended list of capabilities that professional bodies and employers seek to have embodied in graduates. For better or worse, these lists begin to resemble the list of competencies that are required of tradespeople. To delve into why it is problematic to carve up a degree program into smaller pieces, in the next section, we will explore theoretical notions of 'practice' and also revisit what it means to have a higher education.

1.3 What Is Practice? Linking Preparation and Practice

In thinking about learning and teaching in higher education as a form of practice whilst simultaneously preparing graduates for practice-based societal roles, we need to explore a definition of practice within the larger discussion of credentialing for professional practice. Schatzki suggests that practice is "embodied, materially mediated arrays of human activity centrally organised around shared practical understanding" (2001, p. 2). Within this definition and the broader super-complex social and cultural environments, the looming issue is how best to measure whether or not a graduate is capable of crafting their practices in such an environment? Although there now exist far more sophisticated methods for data collection and integration than has existed ever before, making meaning of this data in a higher education context can still be viewed as problematic (Lodge & Lewis, 2012). The flow on effect of this is that inefficient measures are being used within the university context for a range of purposes from assessment to teaching evaluation (Lodge & Bosanquet, 2014). Under these circumstances, it is difficult to make sense of student progress at the micro level of an individual task and, even more so, across an entire program. Given these issues, it is difficult to see how micro-credentials can contribute towards the kinds of understandings that are required of the twenty-first century professional. Is there meaning to be taken from the level of granularity at which these competencies are likely to be assessed? We argue that the problematic nature of measurement in higher education as it already exists will further complicate the difficulty of implementing credentials with a greater level of granularity. Even if the assessment of these credentials occurred at a potentially measurable behavioural level, what does that mean for practice in vastly complex professional roles?

2 Higher Education as Way of Knowing, Being and Doing

As opposed to other levels of education and particularly to vocational qualifications, the purpose of higher education is not just of developing inert or loosely related knowledge or skills, it is a process of becoming (Barnett, 2009). This is discussed in many contexts in higher education, for example, the process of becoming an independent scholar through the PhD journey (Gardner, 2008); or the process of becoming a professional, for example, a nurse (Duchscher, 2008) or developing implied identity as an engineer (Khosronejad, Reinmann, & Markauskaite, 2015). An effective higher education experience will engage the whole person (Dall'Alba & Barnacle, 2007) not just assist them to develop decontextualized competencies. We focus our attention here on the place of micro-credentials as an alternative to the status quo that is degree programs. The issue of micro-credentials as supplementary to formal qualifications as they are currently conceptualised will be taken up later in this chapter.

Barnett (1997) has long argued that the purpose of higher education is not simply to create workers with a set of job ready skills but to help students develop the critical thinking and other high level cognitive skills to prepare them not just for functioning in a job on a daily basis, but to be critique and extend the profession and continue as lifelong learners. This is more aligned with the traditional notion of a 'higher education'. It is an argument that has been echoed by numerous other scholars of higher education (e.g. Dall'Alba & Barnacle, 2007; Haggis, 2006; Molesworth, Nixon, & Scullion, 2009).

2.1 Ontology of Higher Education

Ways of knowing, being and doing are used in a range of contexts surrounding the academy. If we use writing as an example, there are ways of being a writer, knowing about writing and the act of doing writing. This example is explored by Henderson (2014) who suggests that the personal and professional transformations through the acts of doing things, particularly writing, are fundamental to twenty-first century practices of education. Placing writing in most if not all university courses, and professional practice roles, then it is a useful way to inquire into the more abstract, transformational and nuanced experiences of individuals developing knowledge, skills and confidence with writing. Such attempts at transformational education are often purposely designed and facilitated, with a range of feedback mechanisms in place. Whilst the mechanics of writing need to be learned and applied, we need to construct and structure our ideas as a process when writing, which may also become the product. We write to develop a voice, to explore our ideas, play with our fluid identities and to enact reflective practices whether we are the student, the researcher, the practitioner or the person.

Micro-credentials and badges that can enable visibility of the subtle nuances and gradations of the formation of practices may have a motivating effect on learners without it feeling like performance criteria. For example, Clayton, Iwata & Saravani outline approaches where digital indicators (badges) are used to "recognise, validate and reward learners" (2014, p. 706). They situate their assumptions within the personalised learning environment suggesting shifts in responsibility from educators to participants enables learners to be more self-directive, self-motivated (Clayton, 2012), and build more personalised career development plans. Within these technology-driven approaches the potential role of badging can be automated, where data and meta-data are recorded, analysed and stored, often in summative and cumulative ways. This affordance lends itself to assurances of certification in workplace training environments, and in particular, through the use of online professional development modules. We can take this further into a range of professional roles, for example, should we be auto-badging the role of the PhD supervisor, badging a set of skills, for example, library skills (Rutherford, Freund, Jenks, & Mewburn, 2015). Another example is digital-badging the role of the performance evaluator's of continuing professional development in professional groups, for example, teaching or medicine (Davies, Randall, & West, 2015)? What is the requisite knowledge and understanding expected to be an evaluator/assessor of others?

The process of becoming a professional is more than just a matter of collecting a number of inert competencies. 'Becoming' is also about taking what is learned during the process of completing higher education and incorporating that into a renewed or refined sense of self as a professional in the world, often as a multi-professional person. Dall'Alba and Barnacle (2007) called for an 'ontological turn' in higher education marked by an increased emphasis on *becoming* as opposed to a process of collecting skills and knowledge. It is not clear how micro-credentials and badges contribute to what is a more global and holistic process advocated by Dall'Alba and Barnacle. Our contention is that the implementation of these innovations in a higher education context must proceed with caution. Dall'Alba and Barnacle's call for an ontological turn occurred in the time before micro-credentials had any impact on discussions around the current state and future of higher education. Thus, the ontological implications of the implementation of these innovations have largely remained unexplored to our knowledge. These implications need to be addressed before micro-credentials and badges can be formally integrated into higher education.

2.2 *Epistemologies of Practice*

Ontology aside, a separate issue around the cohesiveness of a body of knowledge, compartmentalised further than what is already evident in a degree program, is an issue for micro-credentials in this context. We here explore what the epistemological underpinning of a degree program is, and to an extent, what it ideally should be in order to understand how micro-credentials might fit within this context.

In most parts of the world, accrediting or oversight bodies set a framework for use in designing educational qualifications at different levels. In the United Kingdom for example the Professional Skills Framework (UKPSF) identifies the diverse range of teaching and support roles and environments in higher education that leads towards improving teaching quality and the student experience. In Australia, the Tertiary Education Quality and Standard Agency (TESQA) is tasked with ensuring that degree programs are delivered at the appropriate level of knowledge according to the Australian Qualification Framework (AQF, 2013). Like the UKPSF, the AQF sets out the standards of knowledge and skills for universities who design and deliver all post-secondary qualifications. What many of these frameworks for accreditation have in common is that higher education qualifications tend towards higher modes of evaluation, analysis and the creation of new knowledge.

Treating bodies of knowledge as lower-level compartmentalised packages becomes a challenging issue in this regard. This is due to several complicating factors, the most obvious is that students must develop extensive prerequisite knowledge in order to conduct an effective analysis of an issue or concept. Without this requisite knowledge, it is difficult to enact thinking that is reminiscent of an expert professional. These frameworks provide the scope to create programs of education that allow for the base knowledge to be acquired before students progress to higher levels where the knowledge is synthesised and they are given opportunities to test the knowledge and explore ways it can be put into practice. Without this larger structure, there is a risk that the required synthesis will occur thus undermining the core purpose of the holistic body of knowledge that has traditionally been covered in a degree program.

Considering the epistemological implications of micro-credentials and badges on the body of knowledge covered in degree programs becomes more complicated when considering what professional practice in the twenty-first century looks like and the ways we can imagine it being reshaped. One example of the changing nature of professional practice is that of the T-shaped professional. Hansen and Von Oetinger (2001) argue that many professions now require diverse skills and knowledge that moves beyond the focussed expertise of professionals of the past. By this it is meant that the vertical stem of the 'T' is a deep, coherent knowledge of a core discipline complemented by breadth across other areas, represented by the horizontal top section of the 'T'. These types of professionals are symptomatic of the increasingly complex nature of professional roles, which require creative crafting of skills and knowledge across multiple disciplines, dimensions and bodies of knowledge.

3 Strategies for Integrating Micro-credentials

The focus of this chapter thus far has been to consider the ways in which micro-credentials might supplant the traditional degree program. Moving on from this discussion, we now examine the ways in which micro-credentials and badges might complement the aspects of higher education that are important for developing competent professional who are also good citizens and are equipped for lifelong learning. In doing so, we will explore the use of micro-credentials and badges in three domains; knowledge synthesis, professional development and upskilling/reskilling.

3.1 Knowledge Synthesis, Analysis and Interpretation

One advantage of a degree program that is effectively horizontally and vertically integrated is that the connections between various aspects of the profession and of practice are made clear. This clarification of this integration is important for several reasons. One is that students are better able to understand the purpose of the degree program. A sense of purpose has been shown to be important for student engagement (Horstmanshof & Zimitat, 2007). Of more relevance to our argument is that a properly aligned degree program will allow both students and faculty to see how the body of knowledge is brought together and executed in a professional context. This level of synthesis is important because, without it, comes a fragmented body of knowledge that is unlikely to be suitable for the effective and adaptive professional.

Reflective practitioners and professionals need to be able to see big pictures and engage in both the synthesis of knowledge and in analysis of a range of ways to interpret and understand phenomena. The question therefore is: how can opportunities be created where students get to enact synthesis, analysis and interpretation? One possible way to integrate micro-credentials and traditional degree programs is to use micro-credentials in a way that resembles the structured approaches created by prerequisites. By this it is meant that foundational knowledge and skills could be credentialed meaningfully with appropriate assessment and the synthesis aspects of the required knowledge fulfilled by a capstone experience or capstone task. In this way, both the fundamental knowledge aspects of the degree program can be captured with an opportunity for students to bring the compartmentalised knowledge components captured in the smaller level competencies in a larger project or authentic experience. Such an approach is quite common for meeting these aims, but does beg the question of whether the use of micro-credentials and badges in this way is an advance over a subject or unit level of granularity that is already captured and quantified within degree programs as they currently exist?

3.2 Professional Development

Perhaps a more promising approach to incorporating badges and micro-credentials into higher education might be in the creation of further professional development. The postgraduate qualification is now often seen as the prerequisite level of education for admission to the profession. For example, it is increasingly the case that in order to be a registered psychologist, 2 years of post-degree study and extensive, supervised clinical experiences are required. There is a possible place for micro-credentials and badges in this context. Graduates who are already qualified in a discipline but need to build on the foundation they acquired in their undergraduate education may find much value in being able to present certification for a finer level of knowledge and skill that builds on what they gained during their degrees. The assumption in this approach is that these professionals already have the body of knowledge that make up the discipline and are instead enhancing their capabilities in the profession incrementally by accumulating new knowledge and skill or becoming a specialist in a particular area of practice.

The use of micro-credentials and badges in this context could resemble something like a nested postgraduate program where students draw on what they learned in their undergraduate degree program and either learn to apply that knowledge in a specific practice context, or further specialize with structured education in a particular area. We see the role of badges and micro-credentials here as a way of offering some of the benefits of postgraduate programs by breaking them into smaller pieces allowing for busy professionals to continue to develop and quantify their development in a formal higher education environment, without the commitment of a full postgraduate qualification.

There is one caveat to what we propose here. Postgraduate qualifications offered to professionals from outside their professional area (i.e. students who did their undergraduate education in a different area) would need to consider the use of micro-credentials and badges very carefully in this context. The ability to understand the body of knowledge holistically is also going to be important for postgraduate programs where students are having their first exposure to the discipline. As we have already discussed in relation to undergraduate programs, breaking up the degree into smaller credentials risks losing this synthesis and would need to be considered carefully.

3.3 Up-Skilling or Re-skilling

The ongoing process of academic inflation means that more professionals now need to upskill than was true in previous generations. Being qualified to the undergraduate degree level is often seen as insufficient for practice in many professions. Postgraduate programs and targeted professional development are areas where badges and micro-credentials might be useful, as discussed above. A greater proportion of the population now needs to be skilled and have knowledge in more than one disciplinary area of practice. The rise of the T-shaped professional, as described earlier, is an example of how this is enacted in the workplace. Badges and micro-credential could certainly have some impact on these professionals being able to prove they have proficiencies in breadth and depth beyond their core profession.

While it may seem obvious that there is scope for credentialing professionals in areas other than those they were educated in, implementing this is also going to be challenging, particularly for universities. The traditional structures and practices of delivering higher education do not lend themselves to smaller packages of skills and knowledge as we have discussed. To attempt to build micro-credentials that will cater to those qualified in diverse areas will be a difficult proposition. The credentials need to build on the diverse professional knowledge and experience of the student population while simultaneously seeking consistent evidence across the group that each individual is competent in the skill or has acquired and can use the requisite knowledge. There is much potential for offering micro-credentials in this context but the level of knowledge required and the diversity students bring with them requires innovative models for institutions.

4 Conclusion

From our perspectives within the academy, badges and micro-credentials offer innovative ways for higher education providers to work towards assuring the competencies of graduates. We conclude however, that a reductive micro-credentialised approach for professional practice preparation and continuing professional development should be located within the more lower-order and/or vocationally skills-based activities that can be observed, measured and evaluated. We raise our concerns that this level of granularity does not provide sufficient promise to capture, monitor and accredit the nuances of the development of self through higher order processing required for professional practice roles, inclusive of the subtleties of the ways of knowing, being, doing, and valuing. These latter aims arise from a more holistic, integrated and reflexive approach to education and practice, implicit for complex and uncertain workplaces.

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Chapter 4
Drivers, Affordances and Challenges of Digital Badges

Alison Lockley, Anne Derryberry, and Deborah West

Abstract Digital badges point to a significant and innovative disruption to higher education in how learning achievements will be recognised, made more visible and reach beyond institutions. Digital badges provide a means to display transparent and information-rich links directly via metadata to standards achieved, the badge issuer, the criteria for earning the badge, as well as evidence of the skill or competency the badge represents (Bowen, Open badges anatomy (post on blog Class Hack). Retrieved from http://classhack.com/post/45364649211/open-badge-anatomy-updated, 2013).

There are many factors that drive institutions to consider digital badges, including credentialing of lifelong learning and the need for personalised learning approaches. They can play an important part in the credentialing of flexible and more cost effective pathways for learners, and provide meaningful and relevant ways to identify progress and achievements in a more granular way (Finkelstein et al., The potential and value of using digital badges for adult learners. Washington, DC: American Institutes for Research, 2013).

Digital badges open opportunities for personalised learning pathways for students (Grant, What counts as learning: open digital badges for new opportunities. Irvine, CA: Digital Media and Learning Research Hub, 2014) and for employers to gain clarity around skillsets. Badges enable an alternate credentialing system that supports pathways for, recognition of prior learning, and portability outside the institution they were achieved, linking the worlds of education, work and community in meaningful ways. However, like any new systems, digital badges are not without their challenges. Predictably, digital badges are not universally embraced and differences in strategy and enabling structures range as widely institutions within the sector.

This chapter explores drivers, affordances and challenges for the use of digital badges. Drawing on historical roots and influences such as lifelong learning, opportunities and challenges are discussed in light of specific use cases and emerging examples.

A. Lockley (✉) • A. Derryberry • D. West
Charles Darwin University, Darwin, NT, Australia
e-mail: alison.lockley@cdu.edu.au

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1 Introduction

> Badges can help engage students in learning, and broaden the avenues for learners of all ages to acquire and demonstrate—as well as document and display—their skills… Badges can help speed the shift from credentials that simply measure seat time, to ones that more accurately measure competency… And, badges can help account for formal and informal learning in a variety of settings.
>
> U.S. Secretary of Education Arne Duncan (Duncan, 2011, p. 1)

While the concept of badging has been around for some time (for example, Scouts and Guides) (Halavais, 2012), digital badging, with the affordances it brings, has only recently garnered international attention as a potentially positive disruption across all levels of education. This is due, in part, to the rise of "gamification" (defined by Karl Kapp (2012, p. 10) as the use of "game-based mechanics, aesthetics and game thinking to engage people, motivate action, promote learning, and solve problems") in education, wherein badges mark progress, achievements and advancement at various levels. More importantly, the current digital badge movement was born of a desire to acknowledge that learning happens anywhere and anytime, both formally and informally, and that, regardless of how learning occurs, learners need a way to communicate skills and knowledge that traditional methods don't enable.

The digital badge movement got its start at a 2010 conference in Barcelona hosted by Mozilla (Ash, 2012), sparking the launch of Mozilla's Open Badges project to establish a mechanism and open standard for recognizing the learning that takes place in after-school programs and other informal learning situations. Public interest in the digital badge movement is credited to U.S. Secretary of Education Arne Duncan's 2011 speech (Duncan, 2011) to the Digital Media and Lifelong Learning Competition (MacArthur Foundation, 2011) regarding the ubiquity of learning and the potential of badges to acknowledge and document learning inside and outside the classroom. The competition itself brought together education institutions of all levels around the world, government agencies and business/industry organisations to create badges that "inspire learning and translate 'anytime, anyplace, any age' learning into a powerful tool for getting jobs, finding communities of interest, and demonstrating skills, competencies and achievements." (MacArthur Foundation, 2011, p. 1)

In March of 2013, Mozilla released version 1.0 of the open technical standard (Thompson, 2013) to create, issue and verify Open Badges. The standard was a community-authored effort, as developers and other interested parties around the world came together to define the elements and characteristics of Open Badges, the ecosystem in which they would live, and how Open Badges would interoperate. In the wake of the release of the standard, several key initiatives were launched in 2013.

- The Bill, Hillary and Chelsea Clinton Foundation joined with Mozilla Foundation, MacArthur Foundation, and Humanities, Arts, Science, and Technology Alliance and Collaboratory (HASTAC) to announce the *2 Million Better Futures* initiative (MacArthur Foundation, 2013). The focus of the project was to award two million badges to students and workers acquiring twenty-first-century skills over the ensuing 3 years. After a year, it became clear that the goal had been surpassed, and the project was expanded into the *10 Million Better Futures* initiative (Open Badges, 2014b)
- Badge The UK was launched, dedicated to defining and recognising the skills young people need to be successful in life, school and work. The project brings together schools, employers, innovative educators, and charities to recognise all of a young person's achievements, not just the scores a student receives on exams.
- Cities of Learning, launched in Chicago, is a United States effort to turn entire cities into campuses for learning anytime and anywhere and to equip young people with the skills they need to succeed in the twenty-first century (Cities of Learning, n.d.). Digital badges are issued to showcase participation and accomplishments, and unlock deeper learning experiences by connecting to related interests. Each City of Learning is supported locally by public-private partnerships and on a national level by LRNG.org (a spin-off of the John D. and Catherine T. MacArthur Foundation), the Digital Youth Network, and the Connected Learning Alliance.
- Deakin University-led project, funded through the Australian Office for Learning and Teaching, to bring badges to Australian tertiary education providers through resources, courses and forums (Office for Learning and Teaching, 2014).

The years following have seen a further increase in initiatives. In April of 2015, IMS Global Learning Consortium announced the formation of the IMS Digital Credentialing Initiative "to further the adoption, integration and transferability of digital credentials, including badges, within institutions, schools, and corporations," (IMS Global, 2015, p. 1) and to further IMS' leadership in competency-based learning. At the core of this work is the adoption of the Open Badges standard because of the standard's fundamental focus on verifying the competencies of badge holders.

As is evident from the above, there is an increasing interest in the concept of digital badges (Wu, Whiteley, & Sass, 2015), however there remains a lack of qualitative research regarding the use of digital badges in varied educational settings. However, we can draw out the key lessons and opportunities offered by digital badges through exploration of the drivers, affordances and use cases. Much of the power of open badges derives from a deep integration with competency-based education, which provides a framework for more clearly defining learning objectives and shifting the focus to a more explicit connection of content and learning to outcomes. This is at the heart of the drivers yet also presents its' own challenges.

2 Drivers

The emergence of the digital economy and new technology is driving much change in education (Universities Australia, 2013) in the way it is delivered and accessed. There is a drive for future-focussed options while at the same time a push for lower cost alternatives for education. Digital credentials/badges provide a key to a more visible and granular system that is extensible and adaptable to the changing marketplace, and as such may provide part of the answer.

Moves to increase flexibility for learners are connected to widening participation agendas set out by governments in many countries (Bradley, Noonan, Nugent, & Scales, 2008). The widening of participation agenda essentially means that there is a push to increase the number of people completing post-secondary education resulting in a greater diversity of students with many from non-traditional backgrounds (e.g. first in family to attend university, non-school leavers, Indigenous people) (Bradley et al., 2008). These learners come with diverse needs and aspirations which a traditional model of education struggles to meet.

As a result institutions are now striving to offer more flexible and shorter education pathways both to traditional and non-traditional learners (Mandviwalla & Schuff, 2014; Sledge & Fishman, 2014). In particular, the non-traditional segment is a new and growing market of adult learners (Soares, 2013) with prior skills and experience who may work full-time or part-time while learning, may be mobile or transient, and may or may not have participated in formal tertiary education. While traditional education credentials, such as degrees, diplomas or certificates, are still greatly valued there is growing demand for alternatives to earning these credentials. The options may include different combinations of subjects, choice for when and where assessment takes place, and recognition of prior learning.

Learners also strive for more autonomy and agency in demonstrating what they have learned and where they have learned it (Grant, 2014). Connecting and collating the learning experiences across long periods of time is difficult, as much occurs outside education institutions. There is a definite need for more visible and validated credentials, which document and demonstrate lifelong and life-wide learning.

The recent democratisation of knowledge and access has resulted in a massive increase in the availability of learning opportunities and access to education (Bokor, 2012). This includes the fact that knowledge is freely available on the internet for people to pursue when and how they prefer. In a more structured manner, Massive Open Online Courses (MOOCs) on institution-affiliated platforms are now readily available and offer a wide variety of learning opportunities to anyone who has Internet access. There is a strong desire by many learners to collect and collate credentials from these courses, and use them towards employment, professional development or further studies. Additionally, open access means that universities are no longer the holders of knowledge as they once were which is driving changes in both the structure of learning and the expectations of learners (West & Thompson, 2015). Students, government and professions are driving toward employability skills and demonstration of employability outcomes.

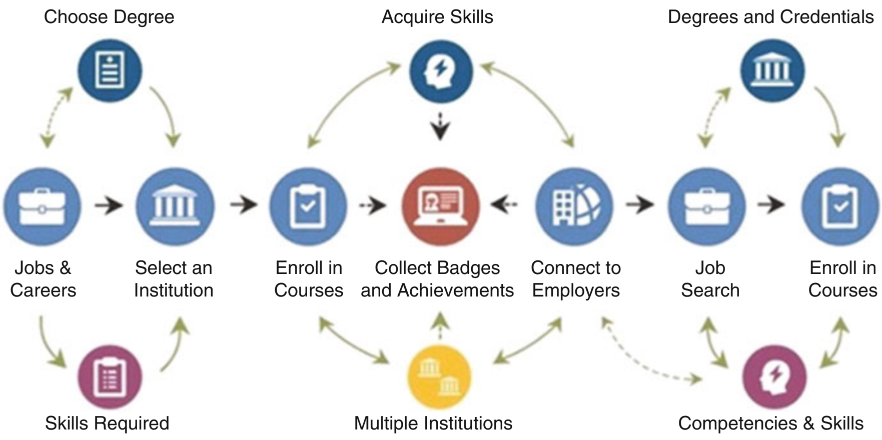

Fig. 4.1 Badges and competency-based learning: a new ecosystem (Open Badges, 2014a)

However, progression through courses, and linking with specific skills is not easy to credential within current traditional certification methods. Transcripts and certification often lack the granularity to link to specific, discrete achievements. Yet because of their modular nature, digital badges linked to competencies can provide a very useful indication of such achievements. This is due to competency-based education, focusing on the ability of students and practitioners to demonstrate skills, attributes and knowledge for specific tasks (Brownie, Bahnisch, & Thomas, 2011), and connecting learning outcomes to competency frameworks that articulate the knowledge, skills and attributes those frameworks comprise. Hence, badges linked to competencies can reveal pathways for skill sets as subsets of qualifications. Further, the progression through a competency-based training program is determined by the student achievements, not by time spent in training.

Specific skill need and skill gaps identified by employers are another key driver for digital badges. To address this, badges can be connected to credentialing skill specific education, and common core skills across different areas. Badges can augment the current learning experience by providing credentialing of specific skills within programs as well as complementary skills and knowledge from extra studies or experience. The following diagram (Fig. 4.1), developed by Blackboard (Open Badges, 2014a), illustrates the interplay among twenty-first-century learners, competencies, badges, education institutions and employers.

3 Affordances and Usability

For generations, the higher education experience has been one of a prescribed course of study within a student's chosen discipline. Upon completion, the student is awarded a credential, which together with a transcript of completed classes and the grades received, represent the entire record of the student's learning and development. The student might assert knowledge and skills, but no actual proof of learning and ability is available in this scant documentation. Universities have been entrusted with the function of assuring that assessment is in line with key outcomes and this has largely been taken on face value based on transcripts which limited information. This means however that the value and applicability of the student's education career is subject to assumption and interpretation on the part of any third-party consumer (e.g., employer, another learning provider) of the student's record.

Digital badges, in contrast, are transparent and information-rich image files that give information about learning outcomes, the badge earner, the badge issuer, the criteria for earning the badge, as well as pointers to or descriptors of the evidence of the skill or competency the badge represents (Bowen, 2013). While a subject within a course of study reflects multiple learning outcomes culminating in a final grade, badges can be awarded for each individual learning outcome. Badges representing discrete skills can be assembled into a more comprehensive skill set, where a single badge might be foundational to multiple classes and badge sets (Derryberry, 2014). This form of micro- and stackable credential is underpinned by and can drive a positive disruption to education, making learning achievements more accessible, visible and reach beyond educational institutions.

One example is to modularize classes into units of instruction (Harrison, 2014) that are more manageable, both in terms of time commitment and cost, for adult learners. Students can enrol for one or more units at a time and earn badges to document their progress. When schedule and/or budget permits, students can pick up where they left off, rather than having to drop out and start the whole class over again. In this way, badges open pathways for recognition and partial recognition of skills and knowledge that have not been possible before.

Additionally, because badges can be agnostic as to the education provider, they enable digital credentials to be issued outside higher education providers. Hence learning outcomes can be evaluated by institutions as evidence of prior learning (Offerman, 2012) and indicators of credit-worthiness (Soares, 2013). This applies equally to recognition of skills and knowledge that a student attains through work or experience. Perhaps most importantly, badges underscore the distinction between—even the decoupling of—learning and assessment (Derryberry, 2013b).

As symbols of accomplishment and achievement, badges rely on evidence-based assessment that is both rigorous and creative (Itow & Hickey, 2013). Clearly articulated rubrics, that indicate to learners what forms of evidence will be accepted and what that evidence should demonstrate, give learners latitude to devise artefacts of their achievement that are both meaningful to themselves and address the rubrics. In this way, badges can mark progress and advancement at various levels, and increase learner motivation (Schenke & Tran, 2014).

Open badges can help make the connection between education and high-value employment more obvious by making explicit what skills and attributes an individual possesses. They connect competencies to job requirements, and connect competency gaps with learning opportunities. In so doing, digital badges reveal unique learning pathways (Finkelstein, Knight, & Manning, 2013; Grant, 2014) that facilitate the accomplishment of an individual's aspirations. In a very real sense, badges bring together two, often disparate, worlds—the world of education and the world of work.

Badges act as a *lingua franca* for learners, educators and employers, and open possibilities for thinking about credentials in new ways (Chow & Otto, 2014). Not only can badges be issued from a variety of providers, including industry, but options arise to "share" (in a similar fashion to airlines code-sharing flights) or recognise others badges, and allow badges to be "stacked" in a variety of ways to achieve further credentials. Such an approach is likely to challenge and disrupt existing credentialing mechanisms and institutions. Yet they must be adopted and accepted in order to achieve this.

In terms of usability, badging platforms are rapidly evolving, enabling the issuing and display of the digital credentials. The Open Badge Infrastructure (OBI) is emerging as a global standard framework for documenting and distributing badges (The University of Southern California, 2013). The OBI framework addresses issues of validity, authenticity, granularity, interoperability, flexibility and transferability and contains embedded metadata derived from this universal standard to indicate (among other things):

- The competency statement
- Standard(s) with which the badge is aligned
- Performance criteria
- Evidence of performance
- Method of assessment and/or rubric
- Recipient
- Issuer
- Endorser (if appropriate)
- Date of issue
- Date of expiration (if appropriate)

This open data exchange or infrastructure is crucial to badges being shared across multiple platforms or systems. The shared standard will make it possible for other systems to process and recognise the badge, allowing it to travel outside the platform in which it was earned and issued (Grant, 2014). Ultimately, the learner should be able to decide where their badge (verified data) will be stored, shared and viewed (Grant, 2014). This may be in an ePortfolio, digital "backpack", blog or other social media site, with direct links to digital artefacts of progress, experience and achievements.

4 Challenges

Badges, amongst other technological innovations, are often referred to as a positive disruption to education, yet the nature of that disruption is not necessarily unpacked. The 'disruptive' nature is connected to changing and challenging education, particularly tertiary and higher education in significant and structural ways. While there are likely to be many challenges that are not yet apparent, the underpinning concept of badges, their structure and various pilots and prototyping efforts reveal that challenges to adoption and implementation of badges cluster around a number of issues.

Some of the opportunities that badges provide would rely on major re-structures in terms of institutional approaches, strategies and culture. Changes of this nature are massive undertakings which flow onto policy, process and requisite curriculum changes. Such elements include potential changes to curriculum design, assessment structures, how pathways are defined and enacted to provide credit for previous learning, acceptable evidence and IT infrastructure.

Badges are largely predicated on competency-based frameworks. Pegging badges to competency frameworks (Everhart, 2014), especially when those frameworks are not extant, is cumbersome. Not doing so removes the rigor of badges, and the knowledge, skills and abilities they intend to represent. Developing competency frameworks requires agreement by discipline or domain experts from within the academy and from practice. For some institutions or disciplines within institutions, this may be a major change in approach which then flows onto major curriculum review and re-development leading to re-accreditation internally and in many programs impacting on professional accreditation. Work of this nature is a major undertaking.

Effective implementation of open badges for learning also requires a fundamental shift in assessment methods (Hickey, 2012; Sullivan, 2013) to a focus on performance and evidence of competence. Assessment design is especially challenging for what are called “soft skills,” “twenty-first-century skills,” or “workplace readiness skills”: teamwork, time management, communication, and others (Sullivan, 2013). This may be problematic as the work of Worthington (2014) suggests that few faculty members are well-versed in assessment methodologies; few institutions provide faculty with resources in this critical area.

For open badges to have currency, they must be recognised and accepted beyond the issuing institution. Further, there must be no question as to the validity of the badge, the badge holder and criteria for earning and receiving a badge. As noted earlier, breaking units into smaller elements of competency, which has an impact on accreditation, also impacts on such elements as program offerings, enrolments and how credit transfer or recognition is handled in an institution. Furthermore, benefits of badges may include recognition between institutions of study or by employers. Most institutions do not currently provide credit for the sub-elements of a full subject/unit within a course/program. For this to occur would require major policy, system and cultural change. In terms of employers, they must also agree to endorse or accept badges in addition to or instead of traditional transcripts and resumes as validation of the skills and competencies of an applicant or employee. This recognition is essential to all parties: employers, higher education providers, and learners *cum* job seekers (Derryberry, 2013a; The Alliance for Excellent Education & Mozilla Foundation, 2013). In many ways, this may be an easier task than changing major systems and structures in education. However, even to achieve this element higher education providers and employers must cooperate in the articulation of competency frameworks so that employers recognise the value of badges in their own context.

The infrastructure required to enable badges is also a complex element. While open badge systems may exist, there are a variety of other issues that an institution will need to deal with to be able to produce a badge which is valid and secure. How these are produced and provided to students is no small issue and very dependent on how they are used, the sophistication of learning management systems which in many cases will be a key part of how badges are earned and deployed within curriculum. With this issue resolved, acceptance by employers is more likely.

As such, it will fall to institutions to proceed with development and recognition of badges in a way that is consistent with international, national, regional and discipline-specific accreditation guidelines (O'Brien, 2013) as well as their institutional strategy and infrastructure. One might expect, given the nature of the challenges that this will begin with small scale and more manageable use cases which require less structural change.

Badges do not exist in isolation, but rather are part of a complex ecosystem. The Open Badges Ecosystem Model (Derryberry, Everhart, & Knight, 2013) provides a framework for thinking about badge system design and implementation. This ecosystem is more than merely a mash-up of web-enabled transcript, curriculum vita, and work portfolio; it is also a way to re-structure the process of education and address the needs of twenty-first-century learners, workers and employers (Fig. 4.2).

In a healthy badge ecosystem, learners demonstrate their competencies in authentic learning environments, capture evidence of their achievements, and have valid assessment to back up the earned badge. Just as badges open the field for innovative learning providers, they simultaneously stimulate rethinking about how learning opportunities are provided and assessed.

Learning providers have traditionally relied on academic accreditation and reputation as validation of the value of their targeted learning outcomes. As badges are agnostic as to the mode of learning that learners employed to gain competencies, learning

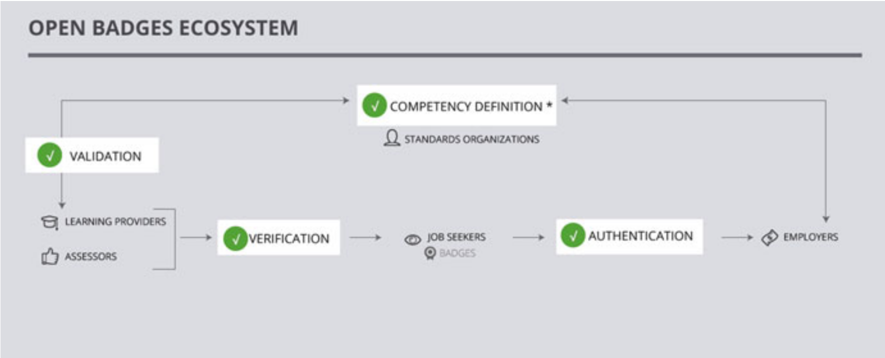

Fig. 4.2 Open Badges Ecosystem Model (Derryberry et al., 2013)

providers are identifying new ways to engage and motivate learners. There are also further opportunities for partnerships and recognition with other providers. However, there is still a need for clear, transparent validation of learning providers and their methodologies, without which the value of their badges could be questioned.

Employers have specific requirements about the attributes and competencies they need among their employees, which are reflected in job descriptions, new-hire requisitions, performance reviews and other ways. To date, it has been difficult for employers to determine what a job seeker states in an employment application or resume is true. With metadata associated with a badge, as previously described, and authentication technology, employers have the means to authenticate that job seekers who present badges to substantiate their assertions of qualification are indeed the ones who earned the badges, and that the badges represent the skills and competencies that the employer seeks. However, this will still rely on valid and robust assessment being constructed in way that can provide this evidence.

The competencies that are called out by employers often reflect regulations, industry standards and best practices as articulated by standards organisations. The competencies defined by standards organisations inform and support a healthy digital credentialing ecosystem. When badges are tied to assessments that are themselves tied to industry standards and best practices, the likelihood of finding the right match between job seeker and employer is greatly improved. Further, learning providers are in a better position to offer learning programs that align with employer requirements.

The connection of digital badges to future work opportunities is exciting. A robust badge ecosystem makes clear the building blocks and learning pathways that lead to a particular job, and from one job to the next. Not only that, a job seeker can readily see how their qualifications match up with the requirements of a particular job. In addition, when a job seeker recognises their need to gain new competencies and earn new badges, they can identify a learning provider who can help them acquire what they need.

5 Current Practices

Digital badges point to a significant and innovative disruption to higher education across the board. There are many emerging examples of badges providing value in liberal arts, twenty-first-century skills development and competency-based education programs, vocational education and job training, and faculty and staff professional development. The differences in strategy and starting place range as widely as do the institutions themselves. There are different levels of use from the badges aligned to part of accredited courses, badges with non-accredited courses/activities, and badges to increase motivation. These use cases include:

- Graduate attributes/employability skills
- Vocational Education Training (VET) and Career and Technical Education (CTE) courses/skill sets

- Higher education practicals
- Primary and secondary education
- Game-based learning/gamification
- Admissions eligibility
- Recognition of Prior Learning
- Non-accredited short courses/community courses
- Professional development
- MOOCS
- Community projects

While many programs are not far enough along to be fully evaluated, following are some of the most promising higher education badge implementations.

Rather than addressing the institutional process and political hurdles associated with introducing badges as replacements for or additions to credentials and transcripts, some institutions are focusing their exploration of badges on faculty and staff development programs. Kent State University (public research university in Kent, Ohio) and Cuyahoga Community College (community college based in Cleveland, Ohio) are launching badges for faculty who are porting face-to-face classes to online delivery (M. Nestor, personal communication, May-August, 2014). Faculty earn badges for things like developing rubrics and connecting assessments to learning outcomes.

Co-curricular learning is the focus of several universities' badge programs. Michigan State University (public research university in East Lansing, Michigan) views badges as a way to motivate students to engage in "non-transcriptable accomplishments" that "provide a fun way to gain recognition of activities, participation and learning. Badges awarded in courses… are not considered nor formulated as formal assignment grades." (Michigan State University, 2015) The Joint Education Project (The University of Southern California, 2013) at University of Southern California (private research university in Los Angeles, California) is exploring awarding badges for "otherwise unacknowledged outcomes." or soft skills, such as critical thinking, civic engagement and leadership. DeakinConnect (Deakin University, n.d.) the open learning space of Deakin University (public university in Geelong, Victoria), highlights peer recognition rather than faculty recognition in the recognition of students' achievements in these areas.

The Agricultural Sustainability Institute at University of California—Davis (a public research university) is designing badges for an undergraduate major in Sustainable Agriculture and Food Systems (Fain, 2014). The badges will recognise student achievements in the core competency areas at the heart of the program, e.g., systems thinking, interpersonal communication, understanding values, and experimentation and inquiry. The university will issue both grades and transcripts, as well as badges, to better inform employers about the range of knowledge and competencies that students have attained.

Lipscomb University (private liberal arts university in Nashville, Tennessee) recognises that certain students bring with them a pre-existing set of college-level competencies, knowledge, skills and abilities acquired through prior learning experiences. Through their Customized, Outcomes-based, Relevant Evaluation (CORE) program, Lipscomb seeks to provide quality assessment measures to evaluate, through behavioural activities, and today rewards exhibited competencies with e-credential badges (Lipscomb University, 2015). Each competency area carries its own badges and levels; with badges being earned as each higher-level of competency is met.

Carnegie Mellon University is investigating the application of digital badges in academic programs. They have collaborated with the US Defense Advanced Research Projects Agency (DARPA) (CS2N, n.d.) to develop a badge system to increase the number of students pursuing computer science and science, technology, engineering and math (CS-STEM) degrees. Using mobile apps created on campus, Purdue University (research university in Lafayette, Indiana) gives students and instructors alike the ability to create, issue and display badges for online courses in nano-technology. Concordia University-Wisconsin (private liberal arts college in Mequon, Wisconsin) has re-designed their education technology Master's program to add badges, with the ambition of replacing grades. Quinnipiac University (private university in Hamden, Connecticut) faculty share Concordia's ambition of replacing grades with badges, and, as is being done at Deakin University (see above), are using peer review to verify achievements prior to badges being issued.

As education researchers try to tease out the benefits of MOOCs, Dan Hickey and his team at Indiana University (public research institution in Bloomington, Indiana) have been studying the value and appropriateness of implementing badges in these online learning environments. Early results are promising, with the following accomplishments reported: "high retention rates, substantial Wikifolio posts, high levels of engagement, good average exam scores, enthusiastic sharing of badges." (Kelley & Hickey, 2014). Hickey is conducting a project (funded by MacArthur Foundation) to introduce badges and badge practices to the Open edX platform, and through collaboration with higher education innovators who want to implement digital badges. Initial collaborators include Deakin University, University of Sydney and Australia National University in Canberra (Hickey, 2014).

Some institutions are investigating all potential applications of digital badges. Curtin University (public university in Perth, Western Australia) is currently piloting digital badges in a number of ways: leadership development; career exploration; admissions; student success; and, student teacher field placements (Curtin University, 2015). At the request of Curtin University, the Badge Alliance (a network of organisations and individuals working to build and support an open badging ecosystem) convened a group of researchers and practitioners to draft a policy framework for higher education institutions preparing to use digital badges (Badge Alliance, 2014). Pennsylvania State University (public research university in State College, Pennsylvania) has identified several key areas in which they see digital badges providing value to the institution: enhance digital identity of learners; enable global perspectives of learners; foster better instruction by facilitating innovative pedagogy; facilitate better instructional management by encapsulating achievements and individual learning pathways; promote the university through the branding that visual design of badges provides; and, establish new business models and monetization strategies (Bixler & Layng, 2013).

Perhaps some of the most exciting digital badge implementations are those that are targeted specifically at workplace requirements. Madison Area Technical College (a technical and community college in Madison, Wisconsin) has integrated digital badges into at least 30 non-credit, online continuing and professional development courses in areas such as food service management and health care interpreting. This implementation of badges at Madison College has resulted in standardized non-credit classes; validation of the skills/knowledge gained by students; recognition of the validity of the badges by for credit programs that are now allowing transfer credits for these classes; and employers accepting badges as proof of claims made by students on their resumes (Radnioff & Voigt, 2014). The Manufacturing Institute has launched the National Manufacturing Badge System to recognise the wide range of skills and competencies that workers need to be competitive in today's Advanced Manufacturing workplace. They have partnered with a number of community and technical colleges around the U.S. to provide formal training in these skill areas, and are supplementing formal learning requirements and pathways with their online badging platform to convey their knowledge and skills to employers (McNelly, 2013).

6 Conclusion

While the body of research about digital badges is scant, the depth and breadth of active interest in this emerging innovation suggests that digital badges have a meaningful role to play in twenty-first-century higher education. Digital badges are particularly relevant because they open up our current system of credentialing to more nuanced levels of understanding, and allow more transparent evidence-based approaches (Grant, 2014). Digital badges enable linking directly with evidence of learning, as well as details of the skill or outcome they represent. Further, digital badges can be "stacked" together in different ways to enable flexible learning pathways and support lifelong credentialing of learning.

Facilitating change begins with articulating where we are and what problems need solutions. There are many different aspects of a badge ecosystem that will need careful consideration by education stakeholders. Badges have the potential to fundamentally change how we credential learning and articulate learning pathways, and will need to be developed with consistent frameworks if we are to maximise the potential benefits of interoperability and portability.

Digital technologies have made it increasingly possible to learn anywhere and anytime and digital badges hold a key to enabling transparent, information-rich credentialing of this learning. As such, they support educational reform, with granular and fluid characteristics enabling adaptation to the changing education and job landscapes. It will be up to the sector to harness the opportunities and overcome the challenges to ensure that they are in a form that is of benefit to students and their prospective employers.

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Chapter 5
Evaluating the Public Promise

Sharon L. Gander

Abstract Every credential, including microcredentials and badges, expresses some type of public promise that the world is a better place because that credential exists. The mark or badge means nothing if the implied or stated public promise cannot be upheld. However, the definition of a public promise and evaluating the execution of the promise can be a unique challenge. This chapter explores ways in which microcredentials' public promises may be designed into the credentialing process; discusses evaluation techniques available; and, proposes a simple method for creating an evolving evaluation strategy.

Keywords Public promise • ROI • ROV • ROE • Expectations • Evaluation • Microcredentials • Badges • Certification

1 Promises and Return on Expectations

Even though microcredentials address subsets of a field through packaging discrete, bite-sized skill and knowledge sets with relationships to other microcredentials, they are only one type of credential. The shift in language from credential and microcredential to badge moves stakeholders away from the requirements embedded in the credentialing process to focus on the graphical image of the badge. However, like other credentials, each microcredential must still define its purpose, meaning, and value.

All credentials, including microcredentials, make one or more public promises to stakeholders. All credentials affirm that because of this credential:

- The **earner** is better off with the credential than without it.
- The **industry** is better off with a credential providing standards for practitioners.
- The **public** (those receiving services from the credential holder) is able to see and experience a difference when served by earner.

S.L. Gander, M.Ed., CPT, ID(SEL/SLG), CACP (✉)
The Institute for Performance Improvement, L3C., 9s211 Graceland St., Downers Grove, IL, USA
e-mail: performancepi.gander@gmail.com

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Credential issuers state explicit and implicit promises to stakeholders about the trustworthiness of the credential. The type of credential does not matter; it may be a certificate, microcredential, certification, degree, endorsement, or accreditation. Every kind of credential creates promises and expectations.

Credential issuers exist in every market; they may be schools, trainers, colleges, universities, libraries, museums, community programs, learning and development functions of a business, institutes, or professional associations and societies. Every credential purports to address specific issues. This issue is the heart of that credential's public promise, which must be measured in order to justify its continuation.

Each organization and credential has a unique set of stakeholders with varying perspectives about that credential and its promises. Credential issuers must drive out information about stakeholders' beliefs and identify measures that will show progress in meeting expectations. The following discussion identifies key expectations (in bold). *Table 5.1*: *Publishing Strategy Microcredential Evaluations* lists expectation, along with related data gathering, measurement, and reporting strategies.

1.1 Implicit Expectations

Various stakeholders expect to receive certain types of returns. Some of those expectations have financial impact, but many do not. Each stakeholder has a unique set of expectations for which they wish to see return on expectations (ROE) (Stawarski, 2012). Therefore, before developing a microcredential, issuers must understand their stakeholders' specific expectations.

The most basic and common expectation for any type of credential is **standards**. Every credential recognizes essential evidences of skill or knowledge achievement against standards. The selected assessment methodology validates that each earner has met standards. In promoting a credential, issuers assure stakeholders that applicants are assessed against standards and earners meet or exceed standards.

Credential issuers award credentials in many forms from paper to digital to paraphernalia. Any level of credential may award a digital badge. However, the digital badge or *badge* has become synonymous with the performance- or evidence-based microcredential. While the digital badge itself is merely a digital image which points to the underlying credential, badges visually represent successful demonstration of a microcredential's performance standards. While badges create opportunities for promotional self-marketing and brand co-marketing, their essential value is as an indicator that some form of assessment has occurred and successfully completed by an individual (Finkelstein, Knight, & Manning, 2013).

In the workplace, industry, or professional field, microcredential skillsets correlate to authentic work; often, they equated to work production standards. In education and non-profit, microcredential skillsets convey the potential to change the way the earner navigates his or her world of learning and living (e.g., reading, family budgeting, kitchen science, etc.) Some skillsets prime the workforce development

Table 5.1 Publishing strategy for evaluating public promise

The promise and expectation		The measures			The analysis			Publishing	
Type of promise	Specifics	Public data	Internal/operational data	Anecdotal data	Contextual content	Comparisons	Trends	Frequency	Where published
Market/brand value									
Standards	Valid and defensible standards[a], core skills[b] and assessment methodology	Geo-political data re: needs	Industry or internal organizational benchmarks[a]	Interviews or focus groups	Content analysis, job/task, practice, or cognitive analysis	Statistical analysis	Baseline and trends	Ad hoc (whitepaper) based on designed expectation for revisiting standards	Website
				Document reviews					
		Internet job board listings re: needs		Survey					
Relationship	Connections with other microcredentials, certifications, degrees, and work opportunities	Public trends in geo-political areas where skillsets are needed	Connections to other in-house credentials	Testimonials about personal connections and emerging opportunities	Content analysis, job/task, practice, or cognitive analysis	Statistical analysis	Baseline and trends	Ad hoc	Website
				Document reviews					
		Connection to other publically available credentials (e.g., badge portfolios, other related credentials)		Partnerships with other groups feeding or receiving earners					
Accessible and portable	Can be accessed by earner and consumers; is easy to share		Customer service queues (issuers' queues)	Testimonials related to usability of digital badge	Content analysis of comments	Issue types counts	Baseline and trends	Monthly, quarterly, annually	In-house
			Hits			Hit counts			May wish to publish publicly, as well in annual reports and website

(continued)

Table 5.1 (continued)

The promise and expectation		The measures			The analysis			Publishing	
Type of promise	Specifics	Public data	Internal/ operational data	Anecdotal data	Contextual content	Comparisons	Trends	Frequency	Where published
Longevity	Based on standards	Internet search of similar credentials	Design decisions:	Survey on whether proposed/published lifespan is appropriate		Projected renewals vs. actual vs. actuals	Baseline and trends	Ad hoc survey results	Website
			• Length of availability			Cost of providing digital authentication site			In-house only
			• Renewal requirements					Monthly, quarterly, annually for number of awards and costs	
			Number of awards						
			Cost of making badge available						
Issuers business value									
Financial	Impact on profit margin	Specific business trends[a] (e.g., missed opportunities, revenue, cash flow, decreased expenditures)	Revenue			Cash flow	Current state: historical trend; projected future trend	Monthly, quarterly, annually	In-house
			Expenses			YTD budget			
			Budget						
			Benchmarks[a]			Benchmark changes			
Process—earner pipeline	Status counts of started, in process, completed, dropped		Counts			Ratios of pipeline status points	Current state: historical trend; projected future trend	Monthly, quarterly, annually	In-house
									May wish to publish publicly, as well in annual reports and website

Process—service efficacy	Status counts by type of service (e.g., provided initiation info, guided application submission, resolved badge social media connection, etc.)		Counts		Content analysis of service queues	Frequency analysis TAT (turn-around-time)	Current state: historical trend; projected future trend	Monthly, quarterly, annually	In-house May wish to publish publicly, as well in annual reports and website
Market/brand	Is the microcredential creating our brand or supporting it?		Hits on badges and web pages	Survey		Direction of change (same/up/down)	Current state: historical trend; projected future trend	Monthly, quarterly, annually	In-house
Satisfaction	What is the overall satisfaction with our services?		Service queues	Survey		Direction of change (same/up/down)	Current state: historical trend; projected future trend	Monthly, quarterly, annually	In-house May wish to publish publicly, as well in annual reports and website
Earner's value									
Readiness and self-confidence	Used mostly for core skills[b]	Geo-political data showing low skill in area	Pipeline	Interview Survey	Testimonials (personal stories) Content analysis	Difference between individual with and without microcredential, and at various stages of pipeline	Historical (over time)	Annually or ad hoc	Web, grantors, in-house, marketing
Required in order to work[a]	Applies only where microcredential is a work requirement.	Geo-political data showing low skill in area	Identify businesses that require microcredential as qualifier	Interview Survey Testimonials from businesses with need/filling need	Testimonials (personal stories) Content analysis	Reported preferences and differences	Direction of reported incomes	Annually or ad hoc	Web, grantors, in-house, marketing
Improved income	All earners want to see improvements in their personal status and wage is a key measure.	Census data Labor statistics role data		Survey pipeline members		Reported current state and change over time	Direction of reported incomes	Annually or ad hoc	Web, grantors, in-house, marketing

(continued)

Table 5.1 (continued)

The promise and expectation		The measures			The analysis			Publishing	
Type of promise	Specifics	Public data	Internal/ operational data	Anecdotal data	Contextual content	Comparisons	Trends	Frequency	Where published
Improved job opportunities	Earners often notice access to new opportunities before they see wage increases or promotion.			Survey Interview	Testimonial; keyword analysis	Reported preferences and differences	Direction of reported incomes	Annually or ad hoc	Web, grantors, in-house, marketing
Seen by employer as more skillful	Employers hope to see better qualified and more effective workers			Survey Interview	Testimonial; keyword analysis	Reported preferences and differences	Direction of reported incomes	Annually or ad hoc	Web, grantors, in-house, marketing
Seen by peers are more skillful	Peers report a difference in capability or an increased credibility			Survey Interview	Testimonial; keyword analysis	Reported preferences and differences	Direction of reported incomes	Annually or ad hoc	Web, grantors, in-house, marketing
Career advancement	Promotions and opportunities to change fields or employers; the ability to advance faster than peers can translate to increased income			Survey Interview	Testimonial; keyword analysis	Reported preferences and differences	Direction of reported incomes	Annually or ad hoc	Web, grantors, in-house, marketing
Honors	Opportunities to have work or services noticed			Survey Interview	Testimonial; keyword analysis	Reported preferences and differences	Direction of reported incomes	Annually or ad hoc	Web, grantors, in-house, marketing
Satisfaction with microcredential	Overall satisfaction reported by earners			Survey Interview	Testimonial; keyword analysis	Reported preferences and differences	Direction of reported incomes	Annually or ad hoc	Web, grantors, in-house, marketing

Personal brand includes microcredential	Do individuals publically identify themselves by and with the microcredential		Hits on badges and web pages	Survey Interview Check of social media profiles, email signatures, and individual's web pages	Testimonial; keyword analysis	Counts of numbers of individuals co-promoting brand	Current state: historical trend; projected future trend	Annually or ad hoc	Web, grantors, in-house, marketing
Direct consumer									
Readiness (job/school/level ready)	Do direct consumers feel that the microcredential signals a difference in preparedness?	Internet searches for jobs/schools requiring microcredential		Interview Survey	Content analysis	Reported differences	Current state: historical trend; projected future trend	Annually or ad hoc	Web, grantors, in-house, marketing
Quality differences noticeable	Do direct consumers see a difference in the work of those with microcredential?		Change in business metric (waste, worker comp, et)	Interview Survey	Content analysis	Reported differences	Current state: historical trend; projected future trend	Annually or ad hoc	Web, grantors, in-house, marketing
Satisfaction with microcredential	Can direct consumers access the microcredential badge? Is it valued?		Customer service queues by employer	Survey	Keyword abstraction Queue resolution type	Reported differences Turn-around-time	Current state: historical trend; projected future trend	Monthly, quarterly, annually	In-house (monthly/quarterly) Publically (annually)
Indirect consumer									
Geo-political change	Used to support need for programs and funding.	Geo-political data showing change in skill level or related factors (increased employment, wages, etc.)	Pipeline	Interview	Keyword abstraction	Reported differences	Current state: historical trend; projected future trend	Annually or ad hoc	Web, grantors, in-house, marketing

(continued)

Table 5.1 (continued)

The promise and expectation		The measures			The analysis			Publishing	
Type of promise	Specifics	Public data	Internal/ operational data	Anecdotal data	Contextual content	Comparisons	Trends	Frequency	Where published
Work quality differences noticeable	Difference in work quality for those businesses using credentialed employees	Change in specific business trends[a] (e.g., missed opportunities)	Change in business metric (waste, worker comp, accidents, sales, etc.)[a]	Survey of random indirect consumers	Keyword abstraction	Reported differences	Current state: historical trend; projected future trend	Annually or ad hoc	Web, grantors, in-house, marketing
		Differentiation of businesses using credentialed employees		Interview random indirect consumers					
Observers spontaneous comments	Differences noticed by indirect consumers (e.g., teachers, librarians, law enforcement)	Testimonials from newspapers, public service awards, etc.	Service queue comments	Interview random indirect consumers	Keyword abstraction		Current state	Annually or ad hoc	Web, grantors, in-house, marketing
			Testimonials from service awards						
Awareness of microcredential as differentiator	Is the public aware of the microcredential and see it as a value-added brand?		Hits on info pages, news articles, testimonial videos	Opinion poll	Keyword abstraction	Changes in opinion rating	Current state: historical trend; projected future trend	Annually or ad hoc	Web, grantors, in-house, marketing

[a]Workforce standards for employability or job task completion
[b]Core skills required for life navigation and eventual employability

pipeline by demonstrating prerequisite or *core* skills in individuals who are not yet employable (frequently used with students, returning military veterans, the unemployed, and the underemployed). As such, these pipeline microcredentials stage the process of building an employable skillset.

While badges and digital badges, in particular, are awarded for any type of credential, this chapter focuses on the performance-based microcredential as the most common interpretation of *badging*. In fact, the term *badging* has become nearly synonymous with performance-based microcredentialing.

Microcredentials are performance-based, evidence-based, discrete, and focused (Digital Promise, 2015). Often, they represent a subset of a larger field or skillset. The performance-based nature of microcredentials requires that earners show work and meet standards as defined by the issuer using an appropriate assessment methodology. Meaningful badges show authentic performances.

Microcredentials address only a fraction of a total skillset; often, earners need additional developmental opportunities to supplement or enhance the skillset credentialed. Microcredentials' developmental nature creates unique relationships and opportunities for stacking and for visualizing each individuals' unique path. **Relationship** is another implicit promise and one that is unique to microcredentials.

Another key promise of microcredentials is that experience matters. In her whitepaper, *What Counts As Learning: Open Digital Badges,* Grant (2014) discusses the experiential roots and opportunities of microcredentials:

> There are legions of people who acquire skills, abilities, and knowledge outside classroom walls who lack the necessary credentials to verify what they know and can do. Students who are highly competent or proficient in skills not taught or assessed in schools lack a standardized way to demonstrate their abilities to others. Employees struggling to shift careers after their companies are downsized can face insurmountable obstacles returning to school as adult learners, and without credentials to communicate their knowledge and skills find themselves unemployed or working in low-paying, unskilled jobs. Many learners have abilities, skills, or qualities that are graded or recognized in traditional classroom settings, but evidence of those strengths disappear into databases and stacks of papers, or accumulate in portfolios that are unwieldy to navigate (p. 5).

Like other credentials, microcredentials promise that the world will be a better place because of someone has earned that microcredential (Gander, 2014). Badging and microcredentialing are not new; they have a long history in youth groups, in the military, and even in juried reviews and shows. However, badging has intensified with the rise cloud-based technology, which publish badges to multiple digital locales such as social media, email, and websites, where consumers can authenticate them. **Authentication** of experience is an implicit expectation essential to public trust of the badge and the microcredential behind it.

Badging, as a practice, flourishes in the intersection between social media and software-as-a-service (SaaS) technology. Here, cloud-based software connects the earners' badge and skillsets with the interested direct consumer of those skills (e.g., employer, school placement officer, or recruiter). The authentication connection occurs when consumers view an earner's digital badge image and related metadata.

With diligence, consumers can drill down to authenticate specifics about the performances embedded in the credential along with key information provided by the credential issuer.

The narrower scope and specialty focus of microcredentials creates both strength and an opportunity for chunking performance milestones and highlighting specializations. Microcredentials address slices of a field and, potentially, combine to show: (a) advancement in learning, (b) show breadth and depth of professional experience, or (c) specialization. Microcredentials express individual pathways and personal preferences (Alliance for Education, 2013). When badges accrue in portfolios, the resulting set of images and metadata shows the individual's unique skillset. Therefore, microcredentials promise **individualization** that highlights each individual's developmental history, special interests, and talents. Individualization may be a value-added service implicitly promised—a promise that only exists when the earner exercises it by building a portfolio and sharing it.

As microcredentials proliferate, the profusion of badges creates challenges in marketing and showing value. Nauert (2015) says, "While this affords learners unprecedented freedom, it also can make it difficult to effectively recognize" (p. 1). However, this profusion also creates opportunities to demonstrate specialization and a history of increasing complexity of skillsets. Knapp, Anderson, and Wild (2009) indicate, "as the scope of knowledge and skills for an occupation/profession becomes more comprehensive in both breadth and depth, it becomes less realistic to expect a single individual to master all of the required competencies at the appropriate depth" (p. 360).

Providing digital badges and portfolios for a history of badging implies a promise for the **longevity** of the digital information. In the American Institute for Research whitepaper, *The Potential and Value of Using Digital Badges for Adult Learners: DRAFT for Public Comment*, Finkelstein et al. (2013) state:

> Many of the concrete characteristics that define digital badges and badge systems make them well suited to foster the pursuit of individualized pathways for learning. Badges serve all three parties to a badge transaction—the earner, issuer, and observer—by encouraging a sense of trust in the process. Digital badges are a portable way to recognize achievement; any organization, application, or platform can easily issue and display them. And organizations that issue digital badges increase their potential impact by reaching new audiences and providing learning opportunities that can be recognized (p. 3).

In order for earners to share their growing portfolio of microcredentials, platforms must interface allowing consumers to access each individual's unique journey. As with all technology, digital badging promises ease-of-use for earners and consumers as well as continued **availability**. Without the continuous availability, the badge and the microcredentials behind it lose significance, value, and trustworthiness.

Longevity of digital availability incurs costs over time for the issuer, which in turn creates a need for defining financial viability. Somewhere in the process of funding the microcredentials development, delivery, and badging platform, someone needs to know whether the microcredential has a financial value. Without financial viability, it is difficult to maintain key services. Without those services, the microcredentials fades into oblivion.

Availability, longevity, authentication, individualization, relationships, and standards are a few of the implicit expectations inherent in the choice to provide microcredentials with digital badges. Together, they create a sense of trustworthiness for the microcredential, the issuer, and the earner. However, they are just the beginning.

1.2 Explicit Expectations

Few issuers spell out their explicit public promises to stakeholders. For each issuer and each microcredential provided by that issuer, specific promises and expectations exist, and must be measured and evaluated.

Planning and executing the evaluation of explicit public promises often appears overwhelming. However, the work effort eases, when data gathering and evaluation start during business need definition. Data gathering and interpretation creates the story that marketing needs to promote. When measurement starts at the beginning of the process, data collection becomes a natural part of the delivery process. With data, the evaluation of promise fulfillment becomes an integral element of the credentialing cycle.

Start at the beginning. Define the need, the stakeholders, the explicit promises, and the purpose of the microcredential and associated badge.

2 Stakeholders and Expectations

Stakeholders have expectations. Quantifying expectations allows them to be measured, tracked, and evaluated. Often, abstract and philosophical terminology graces the expectation definition, where measurable terms would allow the issuer to track progress and show value.

Many issuers avoid addressing microcredential value; they assume that the value will emerge over time as earners and the ecosystem of badges grows. This is somewhat shortsighted; it merely delays work effort to a later date and may open the microcredential issuer to challenges. In her book, *Performance-based Certification: How to Design a Valid, Defensible, Cost-Effective Program*, Hale (2012) discusses missteps and oversights:

> Perhaps the greatest mistake organizations make is that they fail to agree on an approach or strategy for evaluating their program. That is, they do not define, either in the beginning or at predetermined points along the way, how the program will be evaluated, what will be used as evidence that the program is successful what data will be tracked and how that data will be captured and reported (p. 246).

Starting the evaluation process during the needs definition or design phase institutionalizes data gathering and reporting, which in turn quickly demonstrates progress. However, if that window of opportunity has been missed, it is possible to start defining a microcredential's value at any time. The best time to start gathering and reporting data related to microcredential stakeholders' expectations is *now*.

As with any evaluation effort, an important first step is to identify key stakeholders and their agendas. Some stakeholders are only interested in seeing accumulation results such as numbers of microcredentials awarded. Others are interested in the financials. Others want to influence decisions or tell their story. In addition, some stakeholders own key data sets or act as gatekeepers to communication channels. Stakeholders to consider include, but are not limited to:

- Current and potential microcredential **earners**
- Current and potential **direct consumers**, such as employers, employment recruiters, college recruiters, and transitioning services for returning military or individuals retooling core skillsets
- Current and potential **indirect consumers**, including those who eventually receive services from the earner and his or her employer or potential employer
- **Funders**, including those who will support individual earners payment for credentialing and on-going personal or professional development
  - In P-20 education (pre-school to age 20), funders may be parents or school financial administrators with a stake in demonstrating successful learning
  - In community markets, funders may be grant providers or institutional financial officers
  - In the professional association market, funders may be the earner themselves or earner's current employer
  - Businesses often fund in-house skills credentialing programs with the intent to show decreased time to proficiency, decreased overhead costs, and increased quality, which means that these programs are funded by departmental sponsors
  - Government entities providing direct funds to individual or to the program (via grants) based on numbers of individuals participating
- **Process and marketing administrators**, including those who staff
  - The credentials processing functions (e.g., application, review, award, renew)
  - The records functions (set up badges and databases)
  - The accreditation of educators
  - The customer service functions that communicate with earners during the credentialing process
- The **public**, who may never receive direct services, but may receive promotional information about the microcredentialing program in order to value the parent organization, field, or credential
  - Schools, youth programs, community programs, and associations promote credentials and credential earners in order to generate participants and funding associated with participants

- Community programs promote credential earners in order to generate support and funding for their parent program or service (e.g., library, museum, institutes, youth programs, etc.)
- Governmental entities

Before gathering data starts, consider the following high-frequency progress measures often requested by stakeholders. While many additional measures can be unique to a microcredential, these measures are consistent across issuers, only the details change.

- For **Market value**, consider:
  - The skillsets expressed in the imagery of the badge and in the metadata
  - The relationships between microcredential badges
  - The expected shelf-life or longevity of the digital information
  - The types of competition that exists and how it could undermine the market's perception of this microcredential
- For **Issuers' business value**, consider:
  - Financials (revenue generated, one-time costs of development, ongoing costs of administration and infrastructure)

    Cost of microcredential development including graphics for badge icon
    Cost of related programs
    Cost of staffing
    Cost of badge delivery
    Maintenance of website and badging services
    Customer service or helpdesk support services for digital badge support services
    Revenue generated through grants or direct payments
  - Market awareness (who knows that this microcredential is available and who does not)
  - Pipeline (how many individuals are in the process of earning a credential, how many have earned it, how many are due to renew it, and how many have renewed it)
  - Process milestones (eligible/qualified, pending, complete, approved/not-approved, badged, renewal pending, renewed)
- For **Earners' value**, consider:
  - Personal satisfaction

    Success—reports pleasure at meeting microcredential's standards
    Confidence—reports increased, self-confidence
    Co-brands self—uses badge publically and tracks hits on their digital badge
    Campaigning—promotes microcredential and draws others to it

- Wages earned
- Career changes (job/role title, promotion, special project)
- Honors (speaker/presenter/writer, titles, awards other than the microcredential itself)
- Opportunities (special projects, mentoring others)
- Benefit-to-cost ratio in accessing digital badge for microcredential
- Opportunity cost (frustration, loss of time) of not being able to digitally promote their microcredential with ease

- For **Direct Consumer**'**s** value, consider:
  - Readiness (is the earner more likely to succeed at next level—e.g., college entrance, work promotion, time-to-proficiency decreased, etc.)
  - Work quality (what changes in the earner's work results—e.g., customer service rating, errors, speed, fluency, etc.)
  - Time-to-fluency (how much faster an individual is at learning a new job or role)
  - Benefit-to-cost ratio for accessing digital badge for microcredential

- For **Indirect Consumer**'**s**, value consider:
  - Impact (creates an impact beyond direct consumer—e.g., a customer service representative with great communication skills provides an indirect value to each person contacted even though that eventual customer may have no knowledge of the skills used by their customer service representative)
  - Liability protection—hiring credentialed people demonstrate due diligences and helps employer build a case against liability claims.
  - Returned value—earners promote organization's brand and microcredential to public (what does the community gain indirectly by having this microcredential available)

With a list of potential expectations to measure, the challenge becomes two-fold—determining which measures to use and then quantifying those measures. This requires a strategy for: (a) gathering extant data, (b) creating data gathering procedures for data that is not extant, (c) creating reporting, and (d) matching reported results to stakeholder audiences. In *Performance-based Certifications: How to Design a Valid, Defensible, Cost-Effective Program*, Hale (2012) says:

> Whatever you focus on, your strategy should encompass both internal and external measures; one without the other can give you a very misleading picture. Only looking at your activities and what you produced won't tell you if the program is fulfilling its goals. Similarly, only looking at the results and at stakeholder feelings won't help you identify ways to be more cost- or time-efficient (2012, p. 243)

Expectations change over time, as does the data collected and the data available for collection. Therefore, it is important to plan the data gathering process, document steps taken, report data regularly, and assess the value that such data has to stakeholders on an ongoing basis. Changing the data collection process over time increases ones responsiveness to stakeholders.

3 The Measures and Their Sources

Data is always available and is abundant. The challenge may be to create an organized approach, as strategy, for gathering and to interpreting it in ways that support strategic decision-making about the microcredential's public promises. Sourcing data is a strategic decision that matches types of data to stakeholder and promise in order to create the visual information that supports specific stakeholder expectations.

Obviously, internal administrative audiences require information on financials, the pipeline of participants queued for badges, the number of badges awarded, and efficiency-effectiveness measures. Meanwhile, the earners themselves prefer information on whether direct consumers value the badge. Selecting the right data sets and communication strategy becomes a strategic opportunity backed by plain analytics and strong sourcing of data. Data sources can range from big data (available in house or through public sources) to interviews and focus groups, from financials to customer service data. Consider the type of data needed, next.

3.1 Big Data and Public Data

Big data is a broad term for an accumulation of data that is too large and complex for processing by traditional database management tools (Big Data, 2015). Access to data sets of this size is not the norm for most microcredential issuers. However, such data can provide issuers insights on specific skillsets, high volume activities, and global trends; it should not be ignored.

Where microcredentialing operates with an organization that generate big data for business purposes, big data can be used to define specific skillsets that increase profit margin, which is one way to monitor behavior change. Tracking changes in the big data flowing through the organization could show results such as decreases of unprofitable behaviors while also showing an increase in the more profitable behaviors. Many of these data sets are framed as trade secrets within organizations. Therefore, learning and development or human capital functions of the organization experience difficulty in accessing this information. However, the effort can be invaluable. For example, consider the potential impact of insurance adjusters with specific skills for handling disaster scenarios such as high winds, fast moving water, storm surges, or all three. Getting the adjustment right under complex conditions in different regions of the world is among the many challenges of the insurance industry. For an insurance company desiring microcredentials in disaster adjustments, the company's own big data could help them define the need and track the differences in credentialed employees versus those without credentials.

On the other hand, the building trades and their related professional associations seldom possess big data sources. However, the insurance companies do; they track claims that highlight issues. Therefore, trades association benefit when they build a trusted partnership with one or two major insurance companies as stakeholders. In partnership, they can leverage key data about differences in insurance claims.

Similarly, anyone can access public information such as complaints lodged with public entities that track workmanship. Working with the public entity, trades association could track whether there is a difference in the number of complaints lodged against credentialed trades' people versus those without credentials.

Many other easily accessible big data sets are public (census, weather, public grants and funds, population services, etc.) Governmental sources regularly parse massive data sets down into tables and trends related to key topics (e.g., population growth in a region, average salary for job roles). Since much of this data is historical, it is possible to recreate a trend from a period significantly prior to initiating the microcredential. Used wisely, this data can define a need, build a business case, and show differences between individuals with credentials and those without credentials.

All levels of government publish data accessible to anyone. For example, local governments collect and publish key information about their service areas, which creates geo-political data sources. Sorted, tabulated, and summarized, this data was intended for use by public officials, service agencies, and the interested public. It is still large and unwieldy, but not as overwhelming as its source big data set.

With internet access and basic spreadsheet software, anyone can find population data for geo-political regions to compare against similar populations in other geo-political regions. Often, historical data is available as well. Creative comparisons build trend data that could show how microcredentialing reversed a trend or bolstered the speed of desired change. Very few credentialers access this information, even though it can be extremely valuable. Consider searching out key data points such as:

- Numbers of targeted individuals (e.g., by role, economic status, age)
- Status of targeted individuals (e.g., education level, economic status, average wage)
- Numbers of individuals queued for service (e.g., individuals at an education level just below the one the microcredential will serve, individuals on public assistance and potentially in need of services, etc.)
- Role-specific data (years in role, average wage by years in role, level of education by years in role)

The value of public data lies in the comparison of the general population data to a specific audience. Comparison shows whether the microcredentialed group has different statistical profile than the larger public in similar situations. For example, a microcredential for professionals may show that those with microcredentials earn ten percent more than their non-credentialed peers do. Such a finding increases the value of that microcredential immensely.

While not big data or government-sourced data, another type of publicly available data sets can be discovered one piece at time. Diligent searches of the internet, libraries, and direct request uncovers unexpected sources. For example, a web search on keywords may identify news articles, blogs, research papers, and businesses that have an interest in those topics. Reading those sources websites and documents may identify data published by other organizations. Contacting organizations to request annual reports, whitepapers, and other published data takes just a little more time. Meanwhile, research librarians help identify professionally researched studies, journal articles, and doctoral theses with additional valuable data.

However, big data and publicly available data sets are not the only sources of data available for exploitation in defining and then evaluating microcredentials' public promises.

3.2 Internal Data

Anyone attuned to data can find it; it floats around most organizations helping them describe their goals and results. Regardless of whether it is business, government, education, or non-profit, every organization generates continuous data about its performance, people, processes, and products. Every organization captures data in corporate analytics, dashboards, and in general business reports such as monthly finances or management reports. Even organizations with limited data gathering and reporting capabilities manage financial data—budget predictions against actuals. Corporate data drives the health of the organization. Access it. Understand it. Use it to support your microcredential.

Likewise, the work of administering microcredentialing programs generates data (e.g., turn-around-time, inter-rater reliability, costs of services, revenue generated). In addition, the flow of individuals through the pipeline (e.g., the number of people at various stages) creates pipeline-specific data. While easy to capture, administrative data tends to need a clear connection to a promise in order to show value.

One premise of digital badging assumes that earners will share their badges on social media, which results in data about the degree of sharing (i.e., hits) that is occurring. The number of hits is one way to show badge availability, accessibility, and value to consumers. However, hits alone do not tell the full story; hit rate combined with other data and tied to specific promises creates a value. For example, hit rates plus a testimonial from a consumer who was one of those hits says more about authentication than does just the hit rate alone.

The most commonly available internal data is financial and administrative. Comparing administrative data against financials creates opportunities to track cost-per-earner, cost-per-dropout, and cost-per-renewal. Some stakeholders (e.g., funders) value these comparisons highly.

Nearly every business tracks customer satisfaction ratings; they tell an important part of the public promise story. Customer service ratings are essentially opinion polls with the opinions provided by stakeholders. Since each stakeholder group's satisfaction levels differ on specific elements of a program, customer service polls must be able to track stakeholder groups and their different perspectives. For example, earners may have one perspective, while direct consumers (employers, perhaps) may have another viewpoint, and indirect consumers or funders may have still different perspectives. Customer service can be set up to track satisfaction with or problems encountered with both the pipeline and technology. Since customer service data includes a variety of data sets—demographics, problem type, conversations transcripts, email trails, and comments—they can be an invaluable source of rich data about pipeline fulfillment and technology issues. Combined with other data set (e.g., financials, hits, testimonials), customer service data adds depth to the microcredentials story.

The process is clear. Early in microcredential development, access data that is native to the business (e.g., budget, processes, membership, etc.). Work with the corporate analytics owners to include the microcredential's key measures of successes. Project data that will naturally flow from the microcredential process. For example, breakout microcredentialing as a line item in budgets and build ways to track pipeline participation.

As programs expand, start tracking the more complex and sophisticated data sets. For example, compare customer satisfaction ratings from credentialed individuals to customer service data for individuals who dropped out without completing their credential. The results often show the root cause for non-completion or a reason for enforcing a program eligibility requirement. The foresight in identifying issues pays off in both customer satisfaction and business viability.

Over time, the needs of the organization change and the data collection and reporting must too. Start simple, build up, and be prepared to change your data gathering as the organization changes.

3.3 Generating Specific Data Sets

Of course, it is always possible to generate data tailored to a specific need. Here, the microcredential issuer plans specific inquiry techniques intended to answer specific questions. Data is collected through surveys, studies, interviews, focus groups, and the collection of testimonials, references in the news or in journals.

Regardless of its source, at some point, the data needs to be manipulated, analyzed, and interpreted, in order to make sense of it and to share insights gained from the sense-making process. Given a collection of data sets, effective interpretation tells a story and shows value.

4 Sense-Making: Turning Data into Value

With meaningful data captured, the task is to make sense of the facts in light of the promises proposed. The analytical techniques for transforming basic numerical and textual data are well-known and addressed in other texts on analysis. For microcredential issuers, this transformation tells the story of how their microcredential meets or exceeds expectations. This is the story of promises kept or forgotten.

Simple numerical analysis provide averages, ranges, completion rates, and more. While valuable, there are other types of analyzes that complete the story by including the human element. Here textual content becomes a valuable data source.

4.1 Content Analysis

In the search for data, words are sometimes the forgotten data set. In his text for qualitative researchers, Lichtman (2013) says, "your task is to organize and make sense of the data. One way to do this is to see if you can identify key concepts that come out of the data. An alternate way to do this is to see if you can develop a story from the data." (p. 242) Words bring in the human element by giving voice to both statistical findings and individual perspectives. Even complex viewpoints lend themselves to content analysis, which in turn creates context for numerical data.

Testimonials, transcripts from interviews and focus groups, or other anecdotal data provide unique contexts. With social media as key medium of exchange, abundant anecdotal data lives on web sites, blogs, discussion boards, emails, and personal posts. Capturing and processing anecdotal data increases its value, as well as availability. Consider these forms of anecdotal data and the challenges in collecting, managing, and analyzing them:

- A social media transaction posting a microcredential and the moment when a badge earner promotes their successful completion of a badge to their social network
- Social media transactions that occur when earners share their story via discussion boards
- Testimonials from earners collected by the issuer and posted on the organization's website
- Traditional media (newspaper, radio, television) stories about earners and the microcredential program
- Longevity study data (5-, 10, 15-years later) tracking career impact
- Testimonials from direct consumers (employers, college recruiters, group leaders) about their interactions with the earner and the earner's microcredential-specific skill set as compared to non-earners

Other contextual data sources include stakeholder interviews, focus groups, emails, and open-ended comments in surveys. In addition, tracking media references provides an immediate value boost by connecting media events to the microcredential. For the same reason, consider tagging and cross-publishing articles on related topics or interviews with program leaders, microcredential earners, and direct consumers; tracking names of and types of media sources and keywords used; and, analyzing these elements as content often highlights emerging trends. While cumbersome, analyzing textual content data can be as simple as keyword abstraction and generalization or as sophisticated as keyword analysis by software. Simple groupings and lists of words and phrases provide a current state perspective that highlights stakeholders' viewpoints. Changes in such lists over time show historical trends and emerging changes in language around the microcredential.

Comparing stakeholders' views captured in text is also valuable. For example, the nominal group technique (NGT) uses a group process to organize and weight key phrases. It can be informative to have stakeholder-specific focus groups work separately and then compare the results.

Surveys or opinion polls use online technologies to allow respondents to weight or value their responses using a scale. Using surveys to rate on key terms abstracted from content creates a value showing affinity or agreement. A scale such as a Likert Scale highlights areas of agreement and disagreement. Ranking shows relative values between key terms. Grouping responses by stakeholder group adds clarity by showing difference in stakeholders' perspectives. Using open-ended responses adds depth to the dialog.

The process of moving keywords through a series of reviews, group processes, and opinionaires creates insights into stakeholders' expectations and transforms words and phrases into valid data via. Traditional comparison analyzes that combines data sources and types is useful when seeking new meanings from mixed data sources.

4.2 Comparison Analysis

Comparison analyzes drive the world of analytics. Consider the following comparison and the situations where each has value:

- Tables
- Charts and graphs
- Year-to-date (YTD)—total so far this year (often compared to a shorter period such a month)
- Year-to-year (YTY)—this year compared to same time last year

With comparison analyzes, it is possible to show a current state, and sometimes an alternative state. For example, budgets show a predictive state and a comparison of YTD to that prediction. Some financials show YTY comparisons, which are especially valuable when there is significant fluctuation in the cycle (i.e., pre-holiday sales may be low in comparison to revenue expectations, but really are on target for the business.)

The complexity of the comparison and analysis depends on the purpose of the analysis. Tables, charts and graphs transform complex statistics into understandable stories. The stories are as varied as statistical analysis can make them.

The advantage of comparisons is in their ability to tell a story. Comparisons show stakeholder where the microcredential meets its public promise and where it needs to improve. Statistical complexity is counterproductive, since the majority of stakeholders are not statisticians.

4.3 Trending

Trend data tells the story of change over time. Showing change in any statistic is relatively easy with spreadsheet technologies. Trend data merely requires foresight and planning in order to collect the data at regular intervals and update trend reports. Trends tell decision-makers as much as financials do. Where financials describe cash flow and investments, other trends convey the story of acceptance and demand. Trends in the number of earner awards, digital badge hits, and the number of direct consumers who indicate a preference to hire earners reveal the rest of the story. Add in the changes in keyword analysis to complete the narrative detailing how the microcredential has changed over time.

Trend data provides a sense of longevity that microcredentialing in its infancy is missing. However, it is possible to ameliorate this with historical trends from public data sources. For example, even early in a microcredential's history, it may be possible to show trends in stakeholder perceptions from pre-microcredential to the first wave of microcredential earners.

Trend data is key to showing that a microcredential is meeting the need and has the potential to continue growing.

5 Expressing the Promise: Publishing the Story

During the microcredential design and development phase, the tools of data collection and analysis define which stakeholder expectations the microcredential promotes. Later, they infuse the administrative process with facts and stories to support the microcredential's maintenance. Continuously available information describes the return-on-expectations (ROE) for stakeholders, while financial data shows and system-generated data (badge hits, web links) show programmatic growth. This is the story of the life and public promise of a microcredential.

Once expressed, the story of the microcredential's public promise is disclosed in different ways as reports to various stakeholders. Some information is shared internally, where the organization needs this data to guide decisions about programmatic changes, funding, staffing, and technology support. Other information is published publicly to promote awareness of the public promise and the organization's progress in meeting that promise.

5.1 Plan to Validate the Promise at Regular Intervals

A regular review cycle assesses the credentialing program's standards and is the minimum review expectation (Jacobs & Glassie, 2004). Review cycle intervals are defined in the design process; however, reporting cycles are more fluid. Regular reporting connects changing stakeholder expectations to emerging needs for renewal, redesign, or retirement of a microcredential. Frequently, reporting reveals gaps, which in turn drive new data-gathering strategies. Regular data gathering and reporting is an essential element of any microcredential program.

At the beginning, plan an evaluation strategy that captures data flowing naturally within the organization and from its technology. Supplement the plan with more intentional data gathering strategies from external public sources or from stakeholders themselves.

Capture data native to the organization such as budget, revenue, and expenses. Access digital badge hits. Apply administrative information such as awards, drop rates, and turn-around time to support the staffing of the microcredential.

Gather anecdotal information in the form of promotional literature, public announcements, news links, and social media discussions. Ask earners to provide early testimonials about the value of their microcredential.

Create studies to research specific public promises that direct and indirect consumers need to see actualized. Such studies often include significant opinion data from earners and direct consumers, where this data may be in the form of surveys, interviews, or focus groups. The open-ended questions of interview and focus groups provide opportunities to uncover unexpected data about promises, the identity of indirect consumers, and indirect consumer needs. Corroborate interview and focus group results through survey or keyword analysis. Tie the data elements together into a cohesive story about the microcredential.

Publish findings and begin tracking changes in findings over time. Some published findings will be regular reports, while others will be irregular ad hoc research findings.

5.2 Reporting

Reporting is a cost-of-doing-business requirement. In order to maintain the microcredential program, every business requires minimal basic financial and user data. Every business deserves to know how it has spent funds and how many earner have acquired the microcredential.

Annual reporting may be the minimum regular reporting. However, quarterly or monthly reporting eases the reporting burden by institutionalizing the data gather and reporting process into the administrative cycle. Smaller report cycles provide time to receive feedback from report recipients on the value of the data reported.

Over time, *ad hoc* reports and whitepapers may be added in order to address specific questions and needs arise.

However, the savvy microcredential issuer positions themselves as the source of valid data and guides the questions that will be asked. The proliferation of whitepapers on the internet demonstrates the marketing value of publishing summary findings.

5.3 Publishing Strategy

Table 5.1: Publishing Strategy for Microcredential Evaluations brings together the implicit and explicit promise or expectation types by stakeholder group with the measurements and data sources, the analysis method, and the publishing strategy. This table provides guidance for strategic decisions on measuring and evaluating

microcredentials' public promise. In effect, it is a short-cut job aide to start the strategic planning for data gathering around microcredentials.

Obviously, each microcredential is different. Therefore, each issuer will select the types of promises that are most important to their microcredential program. Given a list of promise types, it is possible to plan the data gathering, analysis, and reporting process that best fits each microcredential.

For practice, use this table to identify the public promises and measures in the case study below. Define the explicit promises made. Identify which implicit promises exist. Determine whether planned measures and reporting is adequate. List other strategies this organization could use order to tell their success story.

5.4 *Case Study: The Public Promise for Instructional Designers*

The Institute for Performance Improvement, L3C, USA (www.tifpi.org) created a series of 17 microcredentials in learning solution design and development. These microcredentials were positioned as certifications for instructional designers and developers needing to promote their competence in producing quality learning solutions.

Before beginning a practice analysis (see Chap. 23), The Institute reviewed job posting on national job boards and government labor role information. Job posting analysis showed that instructional designer job postings were undifferentiated. Government information indicated that the majority of role incumbents had advanced degrees and earned an average of $29/h (USD). Government sources predicted a 13 % increase in demand through 2025 (BLS, 2014; O*Net, 2013; O*Net, 2014).

In counterpoint, field wisdom uncovered in contextual data showing field fragmentation caused by lateral movers (subject experts who gained skills through nontraditional education and experience) and the influx of untrained international competitors. Neither lateral movers nor the impact of overseas outsourcing had been discussed by government sources. Data in this area was anecdotal.

The Institute chose to develop a series of related microcredentials in learning solution development with the intention of building professional credibility for instructional designers and developers around the world. The microcredential design team included instructional designers with international experience, with masters and doctoral degrees, and with experience as lateral movers. After rolling out the microcredential series, their Director of ID Certifications initiated a series of interviews with stakeholders—practitioners, learning function managers, academics teaching instructional designers, and students of instructional designer. Content analysis showed key points where stakeholders could identify the differences made by competent instructional designers in learners, the learning and development function, and even company operations.

The Director of ID Certifications also engaged in discussion boards mentioning certifications, degree programs, and professional development for instructional designers. Job board content continues to be captured for content analysis.

As the microcredentials rolled out to practitioners, process data began to flow including turn-around-times on reviews, inter-rater reliability, the number of successful versus unsuccessful applicants, financials, and badge postings and hits.

In the future, the Director of ID Certifications plans to survey microcredential earners, generate testimonials from earners, and track renewals, as well. She expects to structure a series of regular reports on key findings ranging from trends in salary, promotions, personal confidence, confidence of employers, changes in job postings, and changes in the way that stakeholders value competent instructional designers.

6 Conclusion

Each microcredential carries with it a series of promises to the earners, consumers, public, and even the issuer. Defining these implicit and explicit public promises drives out the need to measure and track the degree to which promises and expectations are met. Planning the administration process to include data capture, analysis, and reporting increases the issuer's ability to communicate progress. Sourcing data from a variety of sources and integrating it to tell the microcredential and the earner's story gives issuers the greatest opportunity for demonstrating not only due diligence, but high impact.

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Chapter 6
Building Collective Belief in Badges: Designing Trust Networks

Sheryl Grant

Abstract Open digital badges are statements of trust used to vouch that people are who they say they are, and have the qualities they claim to have. Proponents argue that the full potential of badges will be realized when they circulate as credentials. Research on badges suggests that open badges need to be valued by college admissions and employers if they are to be valued by earners. Yet, while the technical standards exist in the open badge infrastructure (OBI) to support badges as a medium of exchange, only a small percentage of badge earners are displaying and sharing them. This chapter explores the complex design challenge of building collective belief to increase their perceived value, focusing on two approaches: credential markets and reputation economy. The first section discusses the limited research on the circulation and acceptance (i.e. perceived value) of badges. The second section examines alternative currencies and how they scale. The third section discusses credentials and credential markets. The fourth section explores ways to build collective belief in badges. The final section discusses how badges can be scaled as reputation and the importance of metadata to this task.

Keywords Design thinking • System design • Reputation • Trust networks • Technology adoption • Credential markets • Metadata

1 Introduction

Building collective belief in open digital badges is a *wicked* design challenge. A seminal report on design thinking written in the 1960s defines wicked design challenges as a "class of social system problems which are ill-formulated, where the information is confusing, where there are many clients and decision makers with conflicting values, and where the ramifications in the whole system are thoroughly confusing" (Churchman, 1967, p. 141). In other words, building collective belief in badges, especially among consequential stakeholders—college admissions officers,

S. Grant (✉)
Duke University, Durham, NC, USA
e-mail: sheryl.grant@duke.edu

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employers, educators, and learners. The challenge of building collective belief is a far more complicated design challenge than making simple badge graphics, although the visual design of badges can be surprisingly complex. Badge system design also demands more effort than designing a series of web activities or services, and when they are designed to function across institutional or other types of boundaries—the entire point of the open badge infrastructure—the complexity of the design task multiplies exponentially.

Professional design strategists who tackle some of the most daunting challenges (i.e. creating a middle class in Peru) argue that the *integration* of complex artifacts is even more critical to acceptance and adoption than designing the artifacts themselves (Brown & Martin, 2015, p. 59). These strategists encourage designers to use two parallel, simultaneous approaches, in which the design of the *intervention* is given nearly as much if not more attention than the design of the artifact itself. Faced with this complexity, which can often seem beyond the scope of any one person's expertise, organizations may attempt to force an innovation to conform to whatever status quo prevails in the hopes that the artifact will gain greater acceptance. As a result, instead of a novel idea disrupting and shaping socio-technical systems, the opposite occurs. The potential and promise of a new innovation becomes overshadowed by whatever is more broadly accepted—if it is accepted at all.

This is a critical topic for open digital badges because there are two markedly different ways to think about building collective belief in badges. In one approach, badges are treated as credentials, which are, "a specific qualification issued by *an authoritative third party* to signify that a person has achieved a particular transferable skill set or accomplishment" (Swanson, 2014, p. 2). In another approach, badges are an innovation borne of the social Web and carry with them the ability to rapidly scale trust among *ordinary people* so that total strangers can build "reputation capital," defined as the "worth of reputation—intentions, capabilities, and values–across communities and marketplaces" (Botsman, 2015, n.p.). Botsman describes this reputation economy as "a social and economic system driven by network technologies that enables the sharing and exchange of assets from spaces to skills to cars in ways and on a scale never possible before" (n.p.). Without a clear understanding of how the new culture of reputation works, badging organizations risk making open badges too much like their traditional brethren, without embracing the digital affordances that make them innovative.

While it is true that digital badge systems have pushed designers to think in innovative ways about pedagogy, learning outcomes, and assessment, these same systems also enjoin us to think carefully about what it means to build reputations online that are grounded in verified, quality judgments. In an open digital badge, if we wish to assess someone's contribution, we have the option to investigate this claim directly. Indeed, many of the badge systems being built include a suite of features that are common in reputation systems like Stack Overflow, Amazon, eBay, and other technological platforms designed to increase social participation. How we learn in the twenty-first century is shifting from "issues of authoritativeness to issues of credibility" (Davidson & Goldberg, 2009), and it can be unclear to what extent badges reflect one more than the other, since they can be designed as both. Furthermore, open digital badges present us with a design challenge to advance principles of credibility that we have yet to clearly define. We see these principles emerging in cloud-based collaboration platforms where social evaluation practices exist (e.g. rating, ranking, voting, "liking," and "friending"); however, the effect of these economies is not always clear (Suhr, 2014). Thus, if we are to see a widespread, collective belief in badges, implementation strategies must grasp how online reputation economies work and how credential markets are built.

This chapter explores the complex design challenge of building collective belief in badges from two approaches: credential markets and reputation economy. The first section discusses the limited research on the circulation and acceptance (i.e. perceived value) of badges. The second section examines alternative currencies and how they scale. The third section discusses credentials and credential markets. The fourth section explores ways to build collective belief in badges. The final section discusses how badges can be scaled as reputation and the importance of metadata to this task.

1.1 How Many Badges?

In a collaborative Mozilla working document from 2012, the authors claim that the ultimate goal of open badges is to help learners "stay in control of their own learning and credentials" (2012, p. 11). The presumption is that learners want more control of their credentials, and the way to gain that control is by acquiring even more credentials and sharing them with employers and college admissions officers. This is an ambitious vision that, were it not for the digital technology involved, is not dissimilar to the rich history of well-intentioned efforts to develop new credentials when established ones no longer seem sufficient. Where badges differ from traditional credentials is that they present two parallel challenges instead of one: develop a massive, decentralized technological infrastructure while simultaneously building collective belief that badges have value. As designers of complex systems have discovered in other endeavors, the chance for large-scale change to take hold increases when the design of the artifact in question is developed in concert with the design of the implementation intervention (Brown & Martin, 2015, p. 59). Thus, it is incumbent on badge system designers to think as much about implementation as any other part of the design process.

A market analysis of badge adoption would be a useful way to gauge whether people are sharing the badges they earn; however, no such report is readily available. What little research exists suggests that the perceived value of badges is lacking. Currently, there are few ways to tally how many open digital badges have been issued, and how many issuing organizations exist. This is surprising for a technology that features open metadata at its core, and perhaps signals the degree of fragmentation that badges are experiencing as they struggle to gain value in an indifferent credential market. Without these numbers, the actual diffusion of badges is mostly speculative. At a summit to spur the growth of badges in 2014, Mozilla Foundation's executive director compared the diffusion of open digital badges to that of email between 1983 and 1996, a 13-year period in which email accounts jumped from 100,000 to over 25 million (Surman, 2014). The number of badges issued, according to Surman's estimates, grew from 3000 in 2012 to 100,000 in 2014. Another Mozilla colleague reported twice that number, with more than 235,000 badges issued at the same point in time (Belshaw & Riches, 2014).

Regardless of which number represents a more accurate estimate of badges issued to date, these data appear to reflect only those badges accounted for in the Mozilla "backpack," a data repository that has limited features other than to collect and display badges. For badges to appear in the backpack, badge earners must create an account and relocate their badges from where they earned the badge. Many more badges are likely to be in "silos," or badge-issuing platforms where learners may elect to do nothing with their badges for a number of reasons. They may not understand the purpose of moving their badges to the backpack, are not clear on how to transfer their badges, or perhaps lack a compelling reason to do so. It is also possible that the technology or user experience involved in sharing and displaying badges in the backpack failed, preventing the transaction from being successfully completed. Even with a 1400 percent increase in badges displayed in the Mozilla backpack between 2012 and 2013 (Belshaw & Riches, 2014), other data suggest that learners are not necessarily driven to acquire more credentials, especially those that have no clear value (Hickey, Willis & Quick, 2015).

The paucity of data about how many badges have been earned and shared has not prevented forecasts about whether badges will gain acceptance. Perhaps the best-known source of these predictions is the Gartner Hype Cycle, a market forecasting scorecard designed to help companies determine when to adopt a new technology (Linden & Fenn, 2003). The Hype Cycle places emerging technologies along a more or less typical progression, from media overenthusiasm ("peak of inflated expectations") to skepticism ("trough of disillusionment") toward a more realistic understanding ("slope of enlightenment") of the technology integration in the market ("plateau of productivity"). In 2014, Gartner placed badges, or "open microcredentials," on the graph at the peak of inflated expectations and predicted that badges would hit the plateau of productivity in 5–10 years. The peak of inflated expectations is defined as a time in the marketplace when there is almost no adoption of the technology and the performance of products is poor. Even more significantly for badges, it reflects human attitudes toward the innovation. At the present moment, we have placed tremendous expectations on badges to motivate learners, help non-dominant job seekers find employment, legitimize competency-based learning, decrease the hold that high-stakes testing has on social mobility, and disrupt the chokehold of higher education on social stratification. These are steep expectations for an emerging innovation that has limited value to learners and consequential stakeholders.

1.2 When Learners Earn Badges

Broadly defined, values are "guiding principles of what people consider important in life" (Fleischmann, 2014), and can have explanatory power in predicting attitudes and behaviors. The value(s) imparted to badges, or the "so what?" question that determines what motivates learners to acquire, share, or display badges is the thorniest issue facing organizations who design badge systems (Grant, 2014). Empirical data about the value associated with badges, while limited, is beginning to emerge. However, what research does exist describes badge value in a variety of ways. A majority of research targets the motivational effect of badges, particularly focusing on the ability of badges to impact learner engagement or participation. Few of these studies describe badges designed as credentials meant to circulate in a medium of exchange; instead, they function more as achievements or rewards within the context of a course.

Not surprisingly, when badges are designed as rewards, incentives, and achievements, learners have different perceptions about their value. For example, college students reported high levels of enjoyment and a preference for badges in a controlled experiment measuring their impact (Denny, 2013). A separate study reported that a majority of college students were indifferent to badges, and a minority had extreme positive or extreme negative responses, including one respondent who wrote that he "died internally" every time he saw a badge (Haaranen, Ihantola, Hakulinen, & Korhonen, 2014, p. 36). In the same study, however, students also reported that they enjoyed sharing and discussing badges with their peers (p. 38). In yet another study, computer science undergraduates demonstrated statistically significant differences in learner behavior, but only with some types of badges, and responses to the badges varied across two courses (Hakulinen & Auvinen, 2014). While these studies do not capture how learners perceive the value of badges as credentials, they do provide feedback about the pros and cons of conflating game mechanics with credentials in course settings, an objective of many badge system designs.

Other studies suggest that there are different types of badge earners whom may attribute value to badges for different reasons, including a 2-year ethnographic study on player types and the Xbox 360 achievement system (Jakobsson, 2011). This research subsequently influenced a typology of badge earners used to describe elementary aged students as badge "hunters, sharers, and dodgers" (Botički, Seow, Looi, & Baksa, 2014). Each of these types perceived badges in different ways. In yet another study on college students, "masterminds" were more likely to engage with badges, whereas "conquerors" were motivated by leaderboards and progress bars, and "seekers" were motivated by storylines (O'Donovan, Gain, & Marais, 2013). These studies and others like them tend to focus on badges as achievements or game mechanics designed to increase student motivation and engagement, which may say more about the effect of badges and system design on user behavior than it does about whether learners value badges. Even so, we can expect learners to perceive value depending on the type of learner and the type of badge (Abramovich, Schunn, & Higashi, 2013).

In studies that examine how external stakeholders view badges, researchers claim that, “the major problem with digital badges at this time is their perceived value” (Hickey, Willis, & Quick, 2015, n.p.). This finding and others emerged from an ethnographic research project that investigated the implementation of more than 25 badge systems. According to the report, “while numerous digital badge systems are functioning in many contexts, badges are still not widely valued by admissions or hiring officials. As such, they are not yet widely valued by many learners” (n.p.). One of the projects included in the report was also the subject of a separate study investigating the successes and failures of a high school digital badge system, which found that stakeholders (students, teachers, after school mentors, and a college admissions officer) did not perceive badges to have value distinct from the academic credit they were receiving for the same learning content (Davis & Singh, 2015).

2 Scaling Perceived Value

Is it possible to design and scale something as complex as value? Geographers describe scale as, “a contingent outcome of the tensions that exist between structural forces and the practices of human agents,” that can be actively produced through relational networks (North, 2005, n.p.). How geographers and economists think about scaling alternative currencies (unofficial currencies that exist parallel to a fiat currency) has some application to the way we think about scaling the perceived value of badges. As economists note, alternative currencies can flourish and appear to serve as “commitment mechanisms” (Pfajfar, Sgro, & Wagner, 2011, p. 47) within communities of interest that share similar cultural values and a defined system of value formation. These currencies, while not widespread, have very distinct value to the communities that support them, and seem to prosper not in spite of a prevailing fiat currency, but because it exists.

Between 1992 and 2011, the number of alternative currencies, (currencies which exists parallel to a national currency), grew from 20 to 224 around the world, with the most in Europe (53) and America (42) (Pfajfar et al., 2011). Contrary to theories that explain past alternative currencies, the recent rise appears to be *positively* related to a nation’s financial stability and growth. Historically, alternative currencies emerged whenever fiat money was not performing its functions (e.g. acting as a means of payment, serving as a unit of account, and being a store of value), which led to a belief in the devaluation of the financial system. However, economists suggest that a different theory explains more recent alternative currencies. In developed countries with more stable economies, for example, alternative currencies *complement* rather than *substitute* the fiat currencies.

In studying complementary currencies, researchers suggest that a dominant, powerful, and stable fiat currency may actually be a precondition for the emergence of alternate measures that gain widespread *local* value. Because processes of scale creation are diffuse and multiple, large numbers of people have access to scale construction—ordinary people seeking some semblance of value formation that is set apart from a more powerful, authoritative fiat system. Applied to badges, this suggests that a shared, collective belief in a perceived value is more likely to occur when there is an established relational network in place, the kind of "moral geography" in which value formation can scale (North, 2005, n.p.).

The scaling of these complementary currencies also bears some resemblance to credential markets. For example, consider certification regimes that operate in broader credential markets (Hansen, 2011), and manage to succeed among well-established communities of practice, or other credential markets that struggle to gain legitimacy and scale, such as those described below.

3 Credential Markets

The question of *perceived value* seems to be contingent on whether a badge is recognized by someone of consequence, particularly stakeholders such as employers and college admissions officers. People often associate badges with credentials, and credentials with degrees or diplomas, but a credential is more broadly defined as a "fact, qualification, achievement, quality, or feature used as a recommendation or form of identification" (Simpson & Weiner, 1989). In other words, credentials provide a way to vouch that people are who they say they are, and have the qualities they claim to have (Grant, 2014). A precondition for *educational* credentials is that they must be "plausible, legitimate abstractions for the parties involved and the purposes at hand in order for them to work at all" (Brown & Bills, 2011, p. 135). Some have argued that badges are in a sense *more* plausible than traditional credentials because they contain metadata and links to evidence. Badge proponents argue that this evidence can provide better indicators of ability than the proxies traditionally used to inform employers and academic officers about a person's skills or knowledge, although this may reflect biases in education systems that are not necessarily designed to have specific applicability to the labor market.

While conventional (i.e. traditional) educational credentials may, "contain remarkably little information" (Hickey et al., 2015, n.p.), this can be considered a benefit for some credential holders. For example, college and university degrees may hold more power when credentials "effectively block substantive judgments" about an individual's actual abilities (Bills, 2003). The completion of a bachelor's degree can mask a less than glowing academic transcript, a type of evidence that has value to some audiences (e.g. academic admissions and parents), but perhaps not others (e.g. employers). There are also personnel offices that have no need for additional information because the credential in question is considered a sufficient threshold of educational achievement for the job. Some jobs may require a 4-year university degree, even though the degree type need not align with the roles and responsibilities of the job, in which case having the credential is enough and the candidate must be trained. Notwithstanding these few examples, the hiring or acceptance processes for employers and college admissions officers can appear largely opaque, making it difficult to gauge exactly what type of evidence is most relevant. The complex stakeholder environment into which open badges are expected to gain a foothold is crowded with many kinds of credentials, and just as many hiring algorithms.

3.1 A Crowded Credential Market

According to the Lumina Foundation, the number of credentials issued by education institutions increased 800 percent in the U.S. over the past 30 years, and in addition to institutions of higher education, an estimated 4000 personnel-certification bodies currently issue credentials to adult learners (2015, p. 1). In 2012, the U.S. Census began collecting data about the circulation of alternative educational credentials, a sign that apprenticeship programs, non-credit courses, on-the-job training, as well as educational certificates, professional certifications, and licenses are on the rise, particularly among mid-career non-Hispanic whites working in the technical fields (Ewert & Kominski, 2014). With the rise of online learning and open educational resources (OER), it is likely that the number of organizations issuing credentials will continue to rise. As Lumina observes, "the credentialing world is confusing, at times even chaotic…the immense growth of online learning and the development of new kinds of credentials such as badges compound the problem further" (2015, p. 1).

High school diplomas, vocational certificates, professional and educational licenses, and associate, baccalaureate, and graduate college or university degrees are also not monolithic in their value, and represent a "hierarchy of prestige" (Brown & Bills, 2011, p. 132). Even within the same credential type there is a completion bias—earning 118 credit hours instead of the 120 required for most bachelor's degree has less exchange value, although having some credit hours has more value than no credit hours at all (National Center for Education Statistics, 2011). Bachelor's degrees, however, are different than certificates, which are considered to be "more-or-less accurate indicators of the knowledge and skills they ostensibly verify" (Hansen, 2011, p. 32), even though they may have less prestige in the absence of a 4-year bachelor's degree or advanced degree. The challenge for badges is that they are, "being introduced into contexts where there is already an abundance of differentiated credentials. There are degrees and diplomas awarded by academic institutions, which are themselves differentiated by levels, prestige, cost, mission, governance, student composition, and areas of study" (Olneck, 2015, p. 8). To design a viable implementation strategy for badges, it is important to understand the environment into which they are expected to hold value, even if only to recognize the complexity of that environment:

> In order to fully comprehend the roles of credentials in societies it is necessary to move beyond monolithic notions of credentials as singular phenomena that operate in the same manner no matter what type of credential, and regardless of what historical or structural contexts they are associated with. Sophisticated concept formation here requires a firm grasp of what credentials are and how they vary. Theories of credentials must come to terms with these matters (Brown & Bills, 2011, p. 133).

Credentials can subsume other types of recognition as well, including prior learning, informal learning, lifelong learning, and experiential learning, which may be translated "into academic 'credit' in order to be 'counted' toward being 'qualified'" (Olneck, 2015, p. 17).

An increasing appetite for more evidence, if not credentials, also seems to be rising as information floods the Internet and leaves digital traces about our identities and online activities. The widespread informal practice of using Google search and social media to learn about job candidates, and the increasing tendency for organizations to rely on work sample tests, standardized psychological tests, bio-data questionnaires, reference checks, structured interviews, and other types of data suggests that the marketplace cannot get enough evidence. The question is whether the evidence contained in badges accurately represents a substantive reality, and is presented in a way that means something to whomever is evaluating that information in an efficient way. Whether or not badges will complement, supplement, or duplicate meaningful information is not yet clear, nor is it clear how they will be perceived independent of other more established credentials.

3.2 Establishing Value

Establishing value may seem like a unique problem facing badges; however, this appears to be a challenge endemic to all credentials, past and present. In America, the search for, "a reliable, portable, and easily verifiable means to document skills" (Hansen, 2011, p. 36) has been going on long before badges, even before high school diplomas became a required credential in the 1930s for what were considered at the time technologically sophisticated industries. The broader credential market has been undergoing a dynamic process for roughly a hundred years, ostensibly to increase trust with widespread documentation of learning that has not always been easy to decipher. Describing the historic state of credentials reaching back to the 1800s, Hansen writes, "the mind boggling array of either unregulated or 'privately regulated' public, private, and proprietary schools, institutes, colleges, and universities that produced [credentials] made it difficult for potential employers and clients to know if they could be trusted" (2011, p. 37). After decades of serious efforts to create a semblance of order out of this array, the Corporation for a Skilled Workforce summarized the "current state of play" of credentials in the twenty-first century:

> The current chaotic patchwork of credentialing systems is not effectively serving businesses, workers, or students. Sub-degree certificates, licenses and other credentials are offered by a confusing array of industry and occupational groups, third-party validators, and educational providers and systems. Every state has unique licensing requirements for various industries, and 39 accrediting agencies are involved in the creation and validation of credentials that are currently in use (Corporation for a Skilled Workforce, 2014, p. 7)

Fortunately, tackling the entire schema of credentials and wrestling it into cohesiveness is not the objective of most badge designers, although all badges may be susceptible to pressure from policy organizations and other education institutions to deliver some degree of uniform clarity. The current state of play described above suggests that educational credentials may be a heterogeneous, ever-present work-in-progress, and have been for the better part of a hundred years. Not all badges will have value, some will have more value than others, and other badges may have limited value—a similar story for credentials past and present. However, there are initiatives underway whose mission is to "clarify the meaning of credentials, make them easier to compare, and make it possible to translate the learning gained from one credential toward securing another" (Lumina Foundation, 2015, p. 2). Instead of one institution dictating academic standards in order to increase credential value, one framework proposes a system by which all other credentials can be standardized.

3.3 Credential Markets

Badges are not the first credentialing initiative to struggle with issues of establishing worth and value. In the late 1800s, Regents based in New York state sought to implement advanced exams that would standardize content, integrate courses of study, and create "one harmonious system" of credentials (Beadie, 1999, p. 16). While Regents' academies at the time awarded certificates and diplomas, they lacked official status beyond the institutions that awarded them; in response, the Regents proposed to award credentials according to common academic standards that could then be translated into a universal academic currency. The rhetoric of John E. Bradley, a high school principal and leading advocate of the Regents' credentialing initiative, is remarkably similar to arguments put forth by organizations promoting open badges today:

> Statewide Regents' examinations promised to provide the standardization necessary to achieve greater currency for academic credentials from place to place. Beyond increased recognition in different localities, however, Bradley also suggested two ways in which the new academic credentials could have direct exchange value: as substitutes for "many of the questionable teachers' certificates granted by county commissioners and city boards of education," and as, "a more uniform, convenient and satisfactory basis for admission to college." In addition, Bradley reiterated the idea that the advanced exam would have a beneficial effect on students themselves, as "an incitement to effort" and as an "incentive to complete solid and coherent courses of study." (Beadie, 1999, p. 19).

Similar to the quandary with badges, the value of a credential depended on how familiar someone was with the institution's academic standards and reputation, particularly its quality of instruction. "Such knowledge may well exist among those that reside in the town or village where the institution is located, but beyond the little section where the school is known, the honor of having graduated from it is about as uncertain as the validity of a stranger's note" (Beadie, 1999, p. 23). Bradley's proposal was designed to develop academic standards aimed at increasing the value of credentials, and regulating the way they were awarded from place to place. The value of credentials then depended on the degree to which the Regents' reputation could be scaled beyond its geographic boundaries, which is discussed in the following sections.

3.3.1 The Downside of High Standards

While the Regents' efforts did raise academic standards, there were several important outcomes that could prove prescient for badges. The first outcome is that high standards "proved too rare to serve as a common currency for the system as a whole" (Beadie, 1999, p. 32). In other words, having higher standards dissuaded some students from pursuing further studies. This winnowing had the effect of increasing the value of the credential among a more limited group of students. Herein lies the tension that all credentials confront: establishing and maintaining the market value of credentials as a means of social mobility without losing sight of the goal to promote democratic quality (Beadie, 1999).

3.3.2 Creating (Limited) Value with a Lack of Common Meaning

Despite multi-year efforts, the Regents' credentials never gained the widespread value that designers sought. A strategy meant to introduce standardization did not establish value and currency across a uniform credential market. Instead, the credentials appear to have gained a limited degree of value because they *lacked* a common meaning. Participating academies and high schools continued to issue their own credentials on their own terms—without this prerogative, argues Beadie (1999), they would have eschewed the Regents' credential system altogether.

3.3.3 Passive Resistance and Active Opposition

Passive resistance also plagued the Regents' credentialing system. During the first year of implementation, only 44 percent of Regents' institutions administered the exams, and less than 3 percent of the entire student body across the Regents' academies participated (Beadie, 1999, p. 20). Elsewhere in the credential market, colleges actively opposed the new system, fearing that the Regents' credentials competed directly with their own courses of study, potentially reducing enrollment and affecting their bottom line. Regents' academies in the mid- to late-1800s offered piecemeal instruction of subjects, which was in contrast to the more organized courses of study that colleges offered toward the completion of a degree. Thus, the implementation of the Regents' common academic currency placed their credentials in contention with colleges—the very same institutions from which they were trying to gain recognition.

3.3.4 Medium of Exchange

A version of the Regents' initial, more ambitious credentialing initiative is still active today. However, a medium of exchange makes use of an intermediary artifact to avoid the inconveniences of a more cumbersome system or process, and the medium of exchange in which the Regents' credentials circulate is currently limited. (A) Stakeholders unfamiliar with Regents' credentials might find it burdensome to interpret their value. A credential-based medium of exchange should permit, "activities performed in one institution of the system to be substituted for the same activities as if they had been performed in another" (Green, 1980, n.p.). Even among 2- and 4-year college credentials this can be problematic; for example, for-profit degrees have less value in the marketplace, and not all college credits can be transferred between institutions of higher education. Like money, credentials are a generally accepted medium of exchange that we use as a measure of value. Unlike money, there is no clear fiat currency among credentials, and value is much more open to interpretation. As explored in more detail in Sect. 4, establishing, maintaining, and building a collective belief in badges involves the identification of trust networks.

4 Building Trust Networks

Building collective belief in badges is a complex implementation task that is fundamentally about understanding key stakeholders and anticipating their responses to new artifacts. It is typically accomplished with a more qualitative and ethnographic approach than quantitative and statistical (Brown & Martin, 2015), and occurs in parallel with the design of the artifact, if not before. As Cooper-Hewitt Museum's Design Exchange badge program learned, building value worked best when done early and in collaboration or partnership with those for whom the system was designed:

> If we started over, we would kick off the program by imparting the meaning and value surrounding the badge ecosystem. We would begin with a strong story to explain why badges were important or why they were of value (Grant, 2014).

More research is needed to understand how intervention design strategies influence collective belief in badges. Some research suggests that campaigns are needed to explain the meaning and value of badges. For example, as Denny (2013) discovered through web log analysis, a positive correlation existed between the number of times users viewed information about the badges, and the number of badges collected (Haaranen et al., 2014). This research focuses on the collection of badges within one platform, however, and not on badges as a medium of exchange that circulates outside the organization in which they were issued.

Iterative prototyping is also an important part of intervention design, in which each development cycle responds to new information from stakeholders. Designers in other fields have learned that iterative rapid-cycle prototyping is a highly effective way to obtain organizational commitment to bring new artifacts to scale (Brown & Martin, 2015). If a badge is meant to have currency as a credential, then those who are expected to perceive value in that badge need to be engaged in the intervention design process from conception to implementation.

Strengthening existing relationships across trust networks at the outset of badge system design, or building new ones, increases the value that badges will have within and across those organizations. Studying both the human and technical systems used by all stakeholders can also greatly improve the perceived value of badges. For example, school districts willing to accept teacher professional development badges may use a specific performance management platform and insist that integration with their technology is essential to widespread badge acceptance. As described in the report, *Making a Market for Competency-Based Credentials*, "where credentials have been most successful, employers have played a role through the entire credentialing process" (Corporation for a Skilled Workforce, 2014, p. 12). According to the same report, however, this approach is the exception and not the rule, "credentialing initiatives led by sector partnerships have, to date, been limited" (p. 13).

As an example of a current trust network, consider the Android developer *nanodegree*. In 2014, Google enlisted the massively open online course (MOOC) platform, Udacity, to train Android developers. Together, the two companies developed a six-course online program to teach software developers how to build apps for the Android platform (Huet, 2015). Udacity has reported that the platform serves roughly four million registered users worldwide, with about 60,000 working on a variety of nanodegrees at any given time (Potts, 2015), many of them designed by industry leaders seeking specific types of knowledge, abilities, and skills.

While it is difficult to gauge how many developers gained employment as a consequence of completing the course and earning a nanodegree, the design of this trust network is similar to "certification regimes" that operate within larger credential markets, and which succeed best when there are well-established communities of practice. In countries like Germany, there is less resistance to industry-driven credentialing in both informal and formal training programs, and learners gain entry to communities of practice along well-organized educational and career pathways with a variety of sector partnerships and governance already established (Hansen, 2011).

5 Badges in the Reputation Economy

Building collective belief in badges as *reputation* is a different design challenge than building collective belief in badges as *credentials*. Open digital badges have emerged from the *new culture of learning* made possible by the connected and pervasive digital systems of the twenty-first century. These same highly social and interactive systems also present us with a *new culture of reputation*, influencing how we build identities online that others find credible and meaningful (Grant, 2016). Credibility is the quality of being trusted and believed in, while authority is about having the power to make decisions and enforce behavior. Grades, degrees, and diplomas represent learning systems based largely on authority. Digital badges, while they can certainly invoke authority, emerged in online communities that valued credibility, where members cultivate their reputations through features, actions, and algorithms that emphasize both social and technical abilities (Grant, 2014).

While credentials are boundary objects that help individuals signal their skills and qualifications to external audiences (Davis & Singh, 2015; Halavais, 2012), reputation is about ordinary people determining what is good, and is built through actions and interactions with others based on "best educated guesses" of the "underlying true state of affairs" (Masum & Zhang, 2004, n.p.). The Internet has vastly accelerated the process of capturing and distributing information about *us* (Resnick, Kuwabara, Zeckhauser, & Friedman, 2000), and this information can now be searched, mined, and analyzed at an unprecedented scale. While the role of reputation systems is ostensibly to facilitate trust, the algorithms that compute and score reputation are often proprietary and kept secret. Small tweaks to these algorithms can have far-reaching implications, and users may be none the wiser about how their reputation is being mined and analyzed by others. More than ever, our reputations are digitized and networked, ubiquitous and permanent, and people the world over can access this reputation instantly, including employers and college admissions officers.

The ability to rapidly scale reputation on the web is creating a powerful way for stakeholders to evaluate potential candidates, whether through Google search and social media, or using more sophisticated analyses that companies pay for to track people's actions and identities online. According to technology forecasters, this is, "the time for nontraditional students and people with circuitous paths to shine" (Fertik & Thompson, 2015, p. 132). The same authors claim that our online reputation is becoming ever more consequential, and will be "crucial to launching a successful career in any field" (p. 138). When Google introduced PageRank, a link analysis algorithm designed to index relevant content and make sociotechnical judgments about the reputation of different web pages, it both made and diminished reputations, launching an entire search engine optimization industry. With the increasing significance of the social web, Google recently began incorporating "social signals" into the complex algorithms that control the rank, relevance, and reputation of search results. These signals are generated by people who share, like, follow, rate, and comment on pieces of content, increasing the value and therefore the reputation score of the author.

Open badges have the potential to operate in this emerging reputation economy in ways that thus far have been largely untapped. Badges contain standard technical specifications, and these open standards (not to be confused with academic standards), help foster a digital medium of exchange that previously did not exist, allowing learners to collect and keep the reputation they have built across the web. Badges also reflect a desire to resolve a peculiar and novel problem in the digital age: to whom does reputation belong online? Only on the Internet can our individual reputations belong to a company. For example, eBay, which implemented one of the first peer-to-peer evaluation systems, prevented Amazon from importing customer reputation to its own platform (Resnick et al., 2000). The idea that our reputations could belong to anyone other than us is a recent phenomenon that applies equally to learning platforms or MOOCs where people can build reputation that cannot be displayed or shared outside the system (Grant, 2016).

Adding open badge metadata to the phenomenon of digital reputation could generate a powerful and structured way of discovering abilities, connections, opportunities, likenesses, and other bits of information that tell others who we are and what we can do. The standard technical specifications or metadata working under the hood of open badges allows increments of learning to be sorted and moved more nimbly across the web, mixed with "chunks" of evidence and presented as an online reputation. It represents a more proactive approach to shaping our online reputation at a time when our digital actions are being surreptitiously mined and analyzed without our knowledge or consent.

The reputation captured in badges can appeal to recruiters, and can be reassembled into a cohesive whole via resumes, or discussed during a job interview. Or, it can be a way to construct an online identity that others value and find meaningful—the so-called and somewhat controversial "self-issued" badge. One organization's discussion of badge value claims that until they gain more procedural validity and public recognition as credentials, "badges offer talking points for a job interview, opening a friendly dialogue between a manager and an interviewee and allowing the latter to speak about accomplishments and interests that might not otherwise arise in conversation" (Rughinis, 2013, p. 2103). In other words, if badges fail to gain value as credentials, they may function just fine as credible reputation.

We already see evidence of this in communities that use badges and other types of social evidence. For example, in different fields like design and software engineering, many employers put less stock in schooled learning and traditional credentials; instead, they value reputation and evidence as keys to advancement. Perhaps best known for these practices are Stack Overflow, the popular social Q&A site for programmers, and GitHib, a code repository for developers. In these communities, programmers leave traces of evidence that signal what they can do, both technical and social. Recruiters looking for talented programmers can find potential job candidates in these spaces, as well as verify communication and collaboration skills that can be hard to gauge from a resume (Capiluppi, Serebrenik, & Singer, 2013). For those who want to liberate their reputation from online platforms, open badges present a compelling vision for how that reputation might be shared and networked.

Having introduced a series of learner scenarios in the Mozilla Foundation and Peer 2 Peer University, in collaboration with The MacArthur Foundation (2011), the authors write that "formal systems do not account for newer skills like digital literacies or for granular skills and incremental learning, and thus a degree or report card tells a limited story about what relevant skills and competencies people have developed along the way" (p. 2). It is not necessary for badges to be credentials in order for this recognition to occur, as we know from e-portfolios. "Open badges would simply provide the means to make one's learning achievements more visible (online) and verifiable (trustworthy)" (Ravet, 2014, p. 37). As Ravet observes, badges can function as a "conversational system," and be used to set targets (aspirational badges) or to state personal values (using self-issued badges):

> The attention and care brought into crafting a very unique [badge] is not different from the attention and care brought into the crafting of a very individual e-portfolio…To the conformist, the outcome of a conversational system might look like a mess, to the innovator, as a source of inspiration (2014, p. 37).

Similar to the way reputation is assessed and evaluated by external stakeholders, badges (and their evidence) become valued not because criteria and standards have been met, but because the collection of achievement badges represents the "richness of the personal experience" (Ravet, 2014, p. 38).

If badge-issuing platforms and organizations fail to make use of rich open badge metadata (including extensions, tags, xAPI, etc.) or fail to make it easy for badges to be easily shared—and thus easily searched and indexed—even the best algorithms cannot bestow value on badges. A discovery platform or search engine must be able to crawl the metadata, which requires the manual creation of a discovery index list, including tags and xAPIs for the badge-issuing platform. Otherwise, even correctly marked badges can become isolated in silos, lacking a way to index them by URL or other identifier. Without an index page, there is no way to find the individual page where the badge exists, nor are there ways to discover links to other pages. If badge-issuing organizations overlook the changing sociotechnical landscape of reputation and ignore the power of open metadata, the perceived value of badges at a broad scale may never be fully realized.

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Chapter 7
Learning Journeys in Higher Education: Designing Digital Pathways Badges for Learning, Motivation and Assessment

David Gibson, Kathryn Coleman, and Leah Irving

Abstract Educators worldwide are witnessing a change in thinking concerning digital learning, teaching and assessment resources as well as the theories and practices connected to making claims about learning based on digital evidence. These shifts are occurring as three elements have combined to form new digital pathways for learning: (1) self-organizing learning groups, (2) digital badges, and (3) changing conceptions of higher education. This chapter outlines three primary roles of digital badges for supporting learning journeys in higher education: bringing *visibility and transparency* to learning, teaching and assessment; *revealing meaningful, identifiable and detailed aspects of learning* for all stakeholders; and providing *a new mechanism to recognize skills, experience and knowledge* through an open, transferable, stackable technology framework. The possibilities for these roles are explored via distinct phases of the journey of learning referred to as 'paths into learning,' 'paths during learning' and 'lifelong learning pathways.' The role of badges as competency credentials and as bridges from informal to formal learning processes elevates the potential of digital badges for transforming teaching, learning and assessment in higher education. Team-based development processes and design decisions for creating badge systems for motivating learning are reviewed based on cases stemming from a national study of micro-credentialing in Australia, and the chief instructional approaches and impacts are briefly outlined, with examples from the cases, namely designing badges for learning processes, integrating badges into eportfolio practices, developing autonomy and self-regulation of learners, and utilizing badges for both internal and open external symbols of accomplishment.

Keywords Learning journey • eportfolio • Visibility • Transparency • Self-organizing learning groups • Informal learning

D. Gibson (✉) • L. Irving
Curtin University, Bentley, WA, Australia
e-mail: david.c.gibson@curtin.edu.au

K. Coleman
Deakin University, Waurn Ponds, VIC, Australia

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1 Introduction

Educators worldwide are witnessing a change in thinking concerning digital learning, teaching and assessment resources as well as the theories and practices connected to making claims about learning based on digital evidence. These shifts are occurring as three elements have combined to form new digital pathways for learning: (1) Self-organizing online global communities engaged in informal learning activities, (2) A new globally supported mechanism for sharing and managing data, files, images and metadata concerning those activities known as 'open badges', and (3) Rapidly changing conceptions of higher education, continuing education, and the boundaries of informal to formal learning. So in addition to learners being on a personal learning journey to fulfill their aspirations for professional growth, higher education institutions world wide are also on learning journeys to modernize and respond to these changes, which have the potential for disruption and transformation of the university's business model and role in society. This chapter will explore the issues and challenges of designing digital pathways for these individual and institutional learning journeys.

Personal learning journeys are the multiple individualized pathways of learning increasingly available to anyone, anywhere at any time. Traditional learning pathways are 'approved' connections or 'bridges' to allow learners to move in and out of courses in the same or different sector. Many learners develop their own pathways as they traverse a wide variety of learning experiences related to their ideal identity, evolving conceptions of self, and early career path decisions. When applying for formal credit based on these individualized paths, recognition of prior learning policies and guidelines then impact the learner's navigation of credit for their knowledge, skills and experiences. A new form of exchange currency embodied in the technology of open digital badges can act as signposts indicating points of interest on the learner's journey, signifying new forms of apprenticeship, competency, transparency, access and scale for a range of audiences. These numerous and diverse learning pathways often arise outside higher education raising the question of when and in what ways will higher education give recognition to learning for a range of lifetime achievements. The technology and social forces are now well aligned and waiting for pedagogical and policy creativity from higher education.

While there has always been a complex co-evolution of pedagogy and technology, in which either one can lead and drive a need for change in the other, a central catalyst for building trust and credibility in both informal and formal knowledge networks is the way the group assesses and places value on membership, signs of growth and expertise, and community contributions. Formerly the nearly exclusive province of higher education, now any group through its digital badges and their metadata can make these varied skills, experiences and knowledge evident for a range of audiences and purposes. Designing credible learning ecologies that have both value and currency in the badges they issue is the disruptive shift in learning and teaching that Christensen refers to as 'disruptive innovation' (2010).

Complementing these shifts is the emergence of a shared vocabulary that both acknowledges and extends current theory and practice in assessment. For example, a change in discussions from sources of 'authority' to 'credibility' accompanies the shift from expert conceptions of validity to social group validation (Grant, 2014); and the term 'trust network' has arisen to capture the idea of the fluid and open nature of the globally connected knowledge community (Otto & Ravet, 2014). "Open digital badges are designed to have value that employers and schools will recognise" (Grant, 2014, p. 17). This shared trust and value comes from developing an open connected ecosystem that is aligned to standards, transparent, evidence based, visible, flexible and granular.

Digital badges in higher education are layered with meaning, trust and value implications for the ecosystem of issuers, earners and consumers, including employers (Roome & Willis, 2015). The trust that an employer places in higher education, for example, might be formed through years of recognition of the brand, the quality of its graduates, and confidence in the credential, all of which are now potentially disrupted by the introduction of badges. Adding a new layer of credentials that are more flexible, open to the informal world outside of the enterprise, and developing a new currency exchange in higher education are added complexities potentially impacting all stakeholders in education.

This chapter will outline these and other issues and explore the potential for digital badges to impact higher education, including: bringing *visibility and transparency* to learning, teaching and assessment; *revealing meaningful, identifiable and detailed aspects of learning* for all stakeholders; and providing *a new mechanism to recognize skills, experience and knowledge* through an open, transferable, stackable technology framework. The chapter will draw on experiences and case studies from a national open badge project in Australia. The chapter will explore the following questions: What is badging, what are the possibilities for the processes and tools be used to warrant learning and motivate higher education students? How are institutions implementing a 'whole of program' approach to badging? How can instructors implement a 'whole of instruction' approach to badging? How are people thinking about badging as credentials in higher education? How can badges create paths from informal to formal learning?

2 What Is Badging?

A digital badge can be described through many lenses: the technical structure, its multiple criteria and purposes; and the social, political and educational processes for awarding. Most simply put, a digital badge is a web-based technology, which, by virtue of its technical affordances (e.g. extensible digital format, accessibility, scalability, social media possibilities), has given rise to a global discussion about educational practices and possibilities centered on evidence based learning and assessment. Since assessment is key to the determination of status and value of someone's knowledge, skills and capabilities, and is a key aspect of a formal education, digital badges represent a potentially dramatic alternative assessment mechanism with powerful disruptive potential for higher education. Digital badges are often referred to as disruptive technology (Carlson & Blumenstyk, 2012) because they can operate outside the conventional award of credentials in higher education.

The cultural practice of creating, awarding and displaying badges has its roots in social media and the open web; the practices "emerged from the intersection of digital games practices, online reputation systems used in commerce (e.g. eBay, Wikipedia and Amazon) and media culture as well as the historical custom of awarding recognition via physical status icons, such as ribbons, medals and trophies" (Gibson, Ostashewski, Flintoff, Grant, & Knight, 2013, p. 404) with important implications for higher education institutions modernizing their social web practices by becoming more inventive, collaborative, participatory and mobile (Davidson & Goldberg, 2009).

2.1 An Image File with Metadata

Technically, an open digital badge that adheres to the Mozilla Open Badge Infrastructure (OBI) is a .png' image file with metadata. PNG became an international standard when the World Wide Web Consortium adopted it in 2003 (International Standards Organization, 2004). Launched later by Mozilla in 2011, the OBI utilizes the .png standard to create *trust networks* among issuers, badge recipients, and other consumers, including organizations that recognize badges as signs of skills and achievement (Surman, 2011). Recently, the IMS Global Learning Consortium, a global, nonprofit, member organization that strives to enable the growth and impact of learning technology in the education and corporate learning sectors worldwide, adopted OBI for integration within institutions, schools and corporations (IMS, 2016). The Open Badge has seven components (see Badge Class Table A2 in Appendix) five of which are required (name, description, image, criteria and issuer) and two that are optional (alignment and tags).

- **Name**
- **Description**
- **Image**
- **Criteria**
- **Issuer**
- *Alignment*
- *Tags*

2.2 A New Process and Symbol Verifying Achievement

In education, the *criteria* for awarding a badge (Gibson et al., 2013) generally fall into one of three broad purposes:

- Incentivize learners to engage in positive learning behaviors

- Identify and recognize progress in learning and content trajectories
- Signify and credential engagement, learning and achievement

Open digital badges are not a 'one size fits all' technology so the process of awarding badges adds complexity to the above structures and purposes. Since the badge is a meaningful signifier of an award given to someone, the process involves and impacts the reputation and intentions of people and their organizations as well as the processes and values given to assessment (Grant, 2014). The badge infrastructure is the mainstay across all of the case studies and pilots used as examples in this chapter.

Badges are as Serge Ravet says, a "trusted relationship" (2014, p. 2) and can be treated as a trust statement and exchange between issuer and earner, earner and self, earner and community. This trust is met and established in the metadata. For example, an informal badge for attending a museum tour means something different than a formal badge from a world renown computing company for demonstrating competency in computer programming. Likewise, a peer-awarded badge for helping and advising means something different than an expert group-based award for the same activity. The boundaries and components of this complex system span a gamut from human behavior, technical understanding of assessment, symbolic value of organizational reputation, and the politics of internal and federated relationships among all the stakeholders of the knowledge society.

The structure, purposes and socio-organizational contexts just outlined give rise to a large number of practical and policy level issues for consideration by higher education leaders, and can quickly lead to a bewildering array of unanswered questions that may hinder the creative adoption of digital badges and other micro-credentials in formal education. However, three broad contextual facts seem clear and lead to an imperative for change. First, the rise of the entrepreneurial learner and self-organizing online global communities engaged in informal as well as formal learning activities are dramatically increasing (Bell, Lewenstien, Shouse, & Feder, 2009; Dabbagh & Kitsantas, 2012; Ellison, Steinfield, & Lampe, 2007; Trotter, 2008). Second, the provision of a globally supported mechanism for trusted sharing of files, images and metadata concerning those activities that guarantee reputational trust; for example, a badge with appropriate metadata cannot easily be 'faked' (Mozilla Foundation, 2013). Third, rapidly changing conceptions of higher education, continuing education, open educational resources and the boundaries of informal to formal learning are adding to the global imperatives for change in higher education, as noted by theorists, researchers and policymakers (Abeywardena & Dhanarajan, 2012; Altbach, Reisberg, & Rumbley, 2009; Gibson & Knezek, 2011; Hassler, 2009; Joyce, 2007; UNESCO, 2005). The confluence of these factors makes it important to examine the possibilities of digital badging processes and tools for the transformation of teaching, learning, assessment and recognition practices, because they foreshadow potential new market opportunities as well as competitive forces in the higher education landscape (Davidson & Goldberg, 2009; Gibson et al., 2013).

3 Possibilities of the Processes and Tools

A ‘learning journey’ perspective is helpful for thinking about the entry points, way-points and possible futures for the processes and tools of digital badging in higher education. This perspective views relationships with learners along three phases of their journey, (1) Before they are formally admitted as students; (2) While they are pursuing formal studies; and (3) As they move on to other pursuits with a need to continue learning. We’ll refer to these as ‘paths into’ (Table 7.1) ‘paths during’ (Table 7.2) and the ‘lifelong pathway’ (Table 7.3) of formal learning in higher

Table 7.1 Badges on the path to formal learning

Journey waypoints	Badging examples
Access to higher education	Learner brings a collection of badges to the review process, which meets admissions criteria. Those badges will have been earned cost-free or at low cost from trusted issuers. Higher education admissions processes accept badges from trusted issuers, creating an alternative currency for pre-university and uni-ready learning experiences.
Recognition of prior learning	Badges become a part of RPL/PLA review processes. Trusted issuers ease the burden of the review process. Badges can be stacked in a variety of ways to meet pre-requisites for courses and units.
MOOC-like learning experiences	Free and low cost access to knowledge becomes ubiquitous; some experiences include trusted badges that signify achievement and are accepted as prerequisites for courses and units.

Table 7.2 Badges on the paths traversed during formal learning

Journey waypoints	Badging examples
Personalizing at scale paths traversed during formal learning	Badges become part of a continuum of personalization strategies by offering alternative self-directed activities. ‘Badges as bridges’ facilitate new cross-disciplinary and trans-disciplinary approaches.
Unbundling and rebundling (Bull, 2014)	Course and unit content is unbundled and badged in new configurations, promoting openness and reuse of teaching and assessment materials.
Assessment as networked credibility and expert authority	Badges are awarded by flexible knowledge communities (e.g. peer groups, expert groups, global groups) within, across and extended from the university. “Open Badges” carry the university’s reputation in micro-credentialing, while internal badging, points, and awards expand the creative use of motivational rewards and game-based learning in the learner’s digital experience.
Scale and automation flexible knowledge communities	In MOOC-like offerings, badging processes enable global scale and a degree of automation while promoting quality learning experiences.
Evidence-based and competency-focused assessment	The tools and processes of badging (e.g. transparency and transportability of outcomes) meld with portfolio assessment processes, promoting the evolution of evidence-based competency-focused assessment in higher education.

Table 7.3 Badges on lifelong learning paths

Journey waypoints	Badging examples
Alumni networks	Badges from one's degree-granting institution help alumni networks to form and adhere around common strengths, interests and aspirations.
Professional certifications	New certificate programs arise with flexible badge configurations that personalize the learning journey.
Co-credentialing and Community Association	Badges awarded from the institution are co-designed and endorsed by national and international associations to generate professional community recognition and new forms of leadership.
Multi-disciplinary and Inter-disciplinary recognition	Badges issued upon application of evidence to a disciplinary community you do not formally learn in, developing new opportunities for learning ecologies and pathways.

education. Running parallel to these phases of the journey, digital badges bring two affordances to the relationship of the higher education institution and its learners: competency credentials and a bridge from informal to formal learning. Additionally, the nuances of credentials, informal and formal learning, trace the identity of the life-long learner.

3.1 Paths into Learning

The traditional way a person accesses higher education is to pass through the formal primary and pre-collegiate educational system of one's country and exit with a diploma, grades and test scores, which are used to validate that one is ready for advanced study. If we consider learning pathways to include school to university, school to work, school to vocational training, school to travel and volunteerism and then back and forward for a lifetime, these pathways are personalized and multifaceted. Alternatives in the form of recognition of prior learning and portfolio entry have arisen to accommodate these personalized paths for students who may be returning to formal education after a hiatus of some years as well as students who may wish to show other evidence of readiness based on their learning pathway for advanced study. Open badges may be used as a bridge to join these methods, with new affordances and possibilities, such as validating micro-credentials of skills, learning experiences, and knowledge by a wide array of badge issuers in informal as well as formal education. For example, a workplace might badge specific competencies that are needed to enter advanced study in mathematics, business, fine arts or technology fields. Or, museums might badge the evidence of learning from visits and engagements in their public outreach projects. The learner can then bring a collection of these badges to the credit review processes for meeting admission criteria. Increasingly, people have open access to a vast array of free online learning opportunities, such as MOOCs offered by top-quality universities worldwide. If these kinds of issuers are trusted partners with higher education, then the processes of review of prior learning can be facilitated and made easier (Table 7.1).

3.2 Paths During Learning

A second set of waypoints on the learning journey in higher education offers badges that might be earned during the time of formal engagement as an engaged or enrolled student. Engaged learners are those who are taking advantage of higher education offerings without a formal enrollment agreement or degree program plan, and enrolled learners are those who are registered to complete a planned degree or credential program. On these paths, there are several options (Table 7.2).

Badges can assist in personalizing at scale, by carrying information about learner choices and adaptations at a more granular level than whole-of-program or course, and whole-of-unit or class. In this way, badges can become *a symbol of unbundling and rebundling* (Bull, 2014, 2015) of learning opportunities offered by the university or institute of higher learning. Another option is to use badges as *signifiers of completed assessments* carrying the signs of networked credibility and expert authority from across the university and its partners. Similar to good grades in a series of 'foundational units' the badged competencies might be more flexibly earned, displayed and utilized than the singular method of final grades in a preplanned core curriculum. "Badges are not a motivator in and of themselves, but they can be a valuable tool for communicating what students know and can do. In that sense, they can be extremely powerful when used as part of a competency-based education program that empowers students" (Curran, 2014, NPN).

Because badges are capable of *representing micro-levels of accomplishment from a wider array of learning opportunities*, they can also become part of the scale and automation of those offerings while becoming integrated into the existing grade and exam system. Finally, these options are part of a movement toward *increased evidence-based learning and competency-focused assessment*, which broadens the concept of 'tests' to 'demonstrations' and allows the assessment of a broader and deeper range of performative knowledge-in-action (Argyris & Schon, 1982).

3.3 Lifelong Pathways of Learning

The idea of a badge as a signpost of engagement, learning and achievement continues as the learner's journey moves past formal education and into lifelong learning. The learner might return for additional advanced study in the future, or might begin to add credentials and experiences to their degree in order to professionally advance and develop their identities. Either in the field, online, or both. Some of the options during this phase of the relationship of the learner to the university or institute of higher education include, *facilitating professional networking*, acquiring certifications and *credentials that are co-designed and co-developed or recognized by professional communities and associations*, and engaging, learning and achieving new heights of knowledge and action across disciplines (Table 7.3). In this context badges are also signifiers of specific kinds of professional identities or dimensions of identity. Several of Gee's (2000, 2008, 2011) identity types are applicable in understanding how badges signify a certain kind of identity. Affinity identity (A-identity) for example, is through association or membership with certain groups or communities and therefore recognized and defined in a certain way. Institution identity (I-identity), that in relation to badges is by association with the institution awarding the badge and bestows the cultural capital associated with the standing of the institution.

Running parallel to the three phases just outlined are two affordances of note: competency credentials and a bridge from informal to formal learning.

3.4 *Competency Credentials*

The existing infrastructure of formal recognition with degrees and credentials in higher education can be traced to the Medieval period when "the right to grant a *licentia docendi* was originally reserved to the [Catholic] church which required the applicant to pass a test, to take oath of allegiance and pay a fee" (Wikipedia, n.d.). Oaths have persisted primarily in medicine and law, and taking tests and paying fees are ubiquitous in higher education.

Badging also involves an implied oath (e.g. I truly did this work and this is truthful evidence of my learning; the university has truly awarded this badge as a sign of my achievement), an implied test (e.g. in order to obtain this badge learners had to perform) and an implied fee (e.g. a badge has cost the learner in terms of time, effort or other resources). These implied components are part of the *trust network* of the value of the badge shared among issuers, learners and public consumers of badges-as-symbols. As Secretary Duncan at the 4th Annual Launch of the MacArthur Foundation Digital Media and Lifelong Learning Competition purports, "badges can help engage students in learning, and broaden the avenues for learners of all ages to acquire and demonstrate—as well as document and display—their skills … Badges can help speed the shift from credentials that simply to measure seat time, to ones that more accurately measure competency. … [a]nd badges can help account for formal and informal learning in a variety of settings" (Duncan, 2011, NPN).

Brandman University "uses direct assessment as part of the university's new competency-based education programs…to issue official digital badges to certify discrete skills as students advance through degree-based programs. Competency-based education (CBE) is an innovative educational method that matches the skills most needed in a 21st century workforce with a formal degree program. With digital badges validating each skill, learners will be able to put evidence of their abilities to work in real time in the pursuit of professional opportunities" (Credly, 2015, NPN).

<u>Award types</u>. Where can badges sit in the hierarchy of existing forms of recognition? The completion awards by higher education typically include academic certificates, associates degrees, bachelor's degrees, professional certificates, master's degrees, and doctorate degrees (including other specialist 'terminal' degrees in law, medicine and education). Underlying these pathways are course completion records (most often with grades) and assignment and test grades.

<u>Award processes</u>. In testing and assessment, contrasted with *norm referencing*, which compares an individual to a group's average performance; *criterion referencing* compares the individual to a standard of performance. This is also referred to as competency-based assessment. A third type, *ipsative assessment* refers to comparisons made over time, usually self-referencing to shoe growth and change over time. Badging can appear in any of the types, but is usually associated with criterion referenced assessment, emphasizing the attainment of knowledge, skills or capacities and the explicit display of evidence of that attainment.

For example, badging in the ipsative mode might more fruitfully be thought of as internal signposts not intended for an external audience, perhaps as points, awards, and levels used to motivate and guide toward goals. Badging in the norm referencing mode might be thought of as a meta-process, for example if a company favors giving interviews to candidates with a certain configuration of badges, that practice will set a norm against which learners will compare themselves.

Open badging more fruitfully be thought of as internal signposts not intended for an external audience, perhaps as points, awards, and levels used to motivate and guide toward goals. Badging in the norm-referencing mode might be thought of as a preliminary level of representation than course and unit titles with grades. For example, a learner might assemble a badge collection to highlight her group leadership and creative entrepreneurial capacities for one purpose, and then assemble another collection to highlight her capacities for mathematical problem solving in biochemistry. Important in these collections and representations, the resume of experience and the variety of learning experiences might vary widely, draw from multiple sources of trusted badge issuers, and have accumulated over more years than a traditional higher education degree program.

Bernard Bull at Concordia University Wisconsin articulates new ways that credentialing is changing due to digital badges. At Concordia, you can "earn your master's degree along with a series of digital badges, each of which represent new knowledge and skill that you are developing as you work through the courses and program" (Bull, 2014 NPN). In this competency based program a student adds badges they desire and allows the university to repackage specialty certificates with a number of badges (see Fig. 7.1) where one badge = a number of credits (e.g. 5 credits of the 25 for a unit).

Badges can be earned for a range of new skills and knowledge:

- "Project-based Learning
- Game-based Learning
- Evaluating Tools and Technologies
- Service Learning with Technology
- Digital Literacy
- Careers in Educational Design and Technology
- Building a Personal Learning Network
- Mind-Brain Education
- Technology, Culture and The Human Experience
- Collaborative Learning

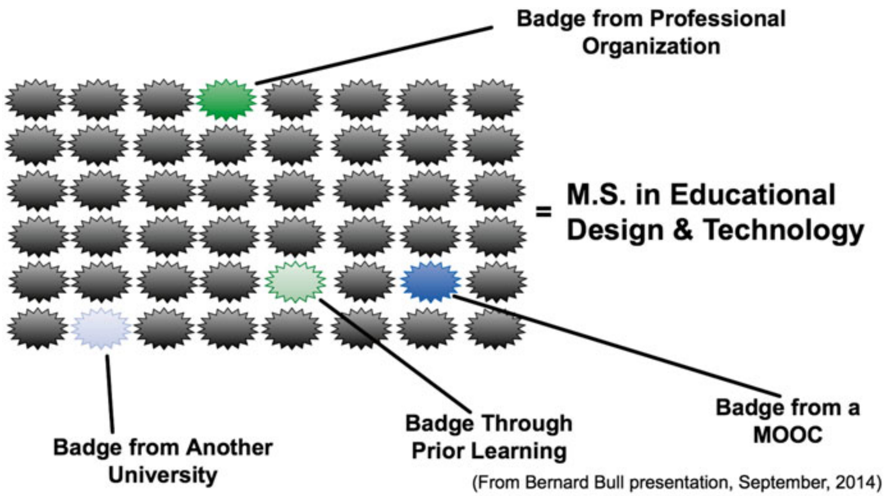

Fig. 7.1 Bull (2015). Example of badges combined in a program structure (M.S in Educational Design and Technology)

- Integrating Technology Models
- Learning Experience Design Foundations
- Social Media for Teaching and Learning
- Internet Safety and Online Identity Management
- Foundations of Educational Design and Technology Ethics
- Data Versus Trend-based Decisions in Education" (Bull, 2014 NPN)

3.5 Paths from Informal to Formal Learning

Given the relevance of graduate employability, outcomes based learning and competency based education in the changing space of higher education, perhaps one of the most exciting uses for open badges are with skills acquisition and the 'certification' of informal learning, bridged with the many possible uses within a formal educational environment.

The value of badges within these contextual situations with a range of audiences and purposes raises the issue of credibility and validity. "In order to compete with traditional credentials like degrees that boast centuries of credibility, organizations first need to create systems of badges that structure their educational offerings, serve audience needs, motivate learners to participate, and provide appropriate evidence to back up their claims" (Hickey et al., 2014). Designing evidence-based badges can go one step toward creating an ecosystem that is trusted, valued and credible by involving key stakeholders in the co-design and co-endorsement of the badge. "Integrating experts in the badging process boosts the credibility of the credentials and its value in a knowledge-based economy. This contributes to the validation of the badge and its potential usefulness in professional settings" (Hickey et al., 2014, p.13).

4 Program Approaches

Most innovations are well advised to start small with an experimental team effort that can then grow naturally to fit and meet the readiness of the larger system. Badging explorations can include whole-of-program implications, for example, badging co-curricular activities for a formalized 'extra certificate' awarded at graduation, or badging from a MOOC to a degree program in the same field, or using badges from a trusted network as part of the review of prior learning. These approaches, labeled '*program approaches*' are contrasted with smaller scope projects such as badging the trajectory of learning in a single unit, labeled '*instructional approaches*.'

In either approach, it is often the case that a team is formed for the research, design and evaluation of a small pilot; and that pilot is then used to decide whether to do more or less with badging and micro-certification. The next sections contain advice and observations from research on teams that have experimented with badge projects during 2012–2014. Descriptive research on funded programs of the MacArthur Foundation supported Humanities, Arts, Science and Technology Alliance and Collaboratory (HASTAC) by Sheryl Grant and colleagues (Grant, 2014) as well as by Dan Hickey and colleagues (Tran, Schenke, & Hickey, 2014) provides observational advice.

4.1 Team-Based Development

Grant's observations summarize lessons from 30 research and development teams that were funded to experiment with badge concepts, systems and approaches (Grant, 2014). Higher education examples were rare in her review (about 25 % of the sample), but the insights from the projects are valuable for any team-based innovation effort in badges.

<u>Team</u>—Include representation from key governance groups such as assessment, courses committee, and academic board; Build a common language and understanding through meetings, consultations, and documents; Acquire good technical talent for the database, integration and design aspects;

<u>Stakeholders</u>—Involve instructors and industry experts as co-designers; Design with users at the table;

<u>Stories</u>—Develop strong narratives as illustrative explanations; Build shared language and understanding with mini-projects such as the construction of shared assessments of common core skills (e.g. communication, problem-solving);

Mapping—Relate to and integrate with informal and formal curriculum; include stakeholders in early stage conversations and keep people in the loop to avoid roadblocks and barriers;

Iterate—Start small, fail often, with low risk;

Visual Design—develop visually simple designs, with a scalable image, and with direct understandable meaning in the symbols.

4.2 Design Decisions for Motivating Learning

Hickey and his colleagues' research on the same 30 cases considered the processes of badging in a situative theory about multilevel assessment (Hickey & Zuiker, 2012) and has discerned design principles for motivating learning with digital badging (Tran et al., 2014).

Providing privileges: If the perceived value of the privilege granted for earning a badge is not associated with something the learner values, he or she is unlikely to engage or persist in the activity associated with earning that badge.

Recognizing identities: As signifiers, a collection of acquired badges is a kind of identity statement. Some badges announce that the owner is a member or supporter of a group (e.g. a team insignia) and other point to acquired knowledge, skills and capacities of the person. A collection of badges is a kind of personal profile.

Engaging with communities: Engagement in the community allows for all stakeholders to play a role in the verification and warranting of evidence, while serving as a kind of identity statement for the student.

Display badges to the public: Providing choice about displaying badges makes learners feel more autonomous, with implications for motivation. However, public displays may also induce competition, which is likely to be more adaptive when people feel a sense of autonomy.

Outside value of badges: Examples of external value include having badges count as academic or course credit, showing badges to outside agencies, and documenting real life applications of knowledge.

Setting goals: Badging approaches often focus on displaying the progressive goal trajectory through which learners follow. Motivation is facilitated further by allowing the users to determine that trajectory.

Collaboration: Badging processes can award group accomplishments, increasing learner motivation to collaborate and complete tasks by relating to others and sharing task performance requirements and responsibilities.

Competition: Scarcity of badges and use of a point system can contribute to competition among badge earners, with positive impacts on some learners.

Evolving requirements for badges: Requiring learners to complete different tasks for the same badge can pique their interest and increase motivation via personalization and variety.

Recognizing different outcomes: Some badges are awarded for meeting some criterion, while other badges are awarded for engaging in some activity, and still others are awarded for social and participatory forms of learning with different consequences for motivation.

Utilizing different types of assessments: Significant consequences for motivation depend on the use of peer assessment, expert judgment and self-assessment.

5 Instructional Approaches

This section discusses instructional approaches in the design of badges for learning, the impacts and similarities with portfolio-based assessment, how badges can help build self-regulated learning skills, and badges that are used internally (rather than as open public signifiers) to motivate and guide learning.

Designing digital badges associated with formative, summative and transformative assessment "force us to examine our current assessment and credentialing structures" (Olneck, 2012, NPN). Badge design from an instructional standpoint begins with identification of the criteria for achievement balanced with the badges alignment with existing standards and structures. This fulfills a key requirement of open badge design that it reflects the specific criteria achieved by the learner for the award as well as how and when the badge is issued.

5.1 Designing Badges for Learning Processes

Since the badge system design process at the instructional level includes raising questions and holding discussions about assessment practices, designing and developing the system to co-exist within current learning and teaching structures is a possible starting point. However, as Sheryl Grant (2014) reminds, "if we overlook what is truly transformative about open badges, we stand unwittingly to replicate outmoded systems of recognizing and assessing learning" (p. 32). The transformational opportunities are for badge systems to be co-designed by key stakeholders, such as the learner, faculty member, disciplinary expert and employer. For instance, faculty members might serve as 'badge hosts' and issuers in a system that enables students to have choices for recognition and validation in a subject area. These two opportunities explicitly extend decision-making power to engage both learners and faculty members and expand the achievement record beyond marks and grades into learning skills and processes that are often ignored in traditional marking systems.

At Dartmouth College in Hanover, New Hampshire, for example, collaborators Michael Evans and Mike Goudzwaard co-designed a badge ecosystem that highlights and recognizes skills and knowledge developed within current assessments for an interdisciplinary class on Science and Religion in American Media. Initially, they decided to experiment with badging to track the portion of the course focused on digital scholarship skills and introduced badging to students as part of the syllabus. Evans considered this challenge of improving quality to improve the standard of performance in his course. "The main objective was to communicate student competency beyond the grade or transcript. In addition to the normal complement of lectures and discussion and exams in the course, students also learn how to use media analysis software and produce digital scholarship. But you would never know that from the course title or grades or transcript information. Badges retain the validity of a grade or endorsement, but are flexible enough for students to communicate to future employers, to grad school admissions committees, or to their friends and colleagues. Their grade says 'I got an A in the course' but the badge says 'I can search, collect, edit, collaborate, compose, curate, annotate, and analyze digital video, audio, and text'" (Kim, 2014, NPN). For their digital scholarship assignments, students could choose to receive both a grade and a badge. Each assignment potentially earned a 'progress badge,' and completion of an entire training sequence or practice sequence would earn a 'completion badge'.

Designing badge systems that align with tacit skills-based knowledge and interlink with a number of learning activities in the program requires good learning and assessment design. As with other pedagogical and technology innovations, digital badges work best if not treated as an 'add on' but are aligned and designed into several parts of the curriculum. Alignment with the learning standards, tasks and assessment can drive change during course renewal processes as the badge system demands specific award to have explicit milestones. At Deakin University in Melbourne, Australia, for example, a pilot of 'Hallmarks' that recognize outstanding achievement in Graduate Learning Outcomes has been established as a result of a university wide curriculum framework implementation. The Hallmarks are co-designed in partnership with industry and the professions where possible and students are encouraged to share these digital credentials in professional social media spaces.

An open badge system can support assessment from multiple contexts, including course organizers, peers, or learners themselves. This flexible and networked nature of badges can mean that there are multiple paths or assessment options for earning a badge, making the system more flexible, ensuring that the needs of each earner are met while defining the learning path constraints. Digital badges support increased learner control (e.g. summative when ready, multiple pathways within a unit) and clearly articulate learning practice for students. Aligning badges to course learning outcomes demonstrates how "learning is cumulative" (Boud, 2010, NPN) while providing an opportunity to build self-efficacy.

Designing badges with clear rubrics and scaffolds helps learner "develop and demonstrate the ability to judge the quality of their own work and the work of others against agreed standards" (Boud, 2010). The Instructional Psychology and Technology Department at Brigham Young University have designed a rubric for learners to self direct their badge pathways, learning and assessment. This example makes explicit the 'eco-system' or learning ecology in the rubric and includes the levels of badges or badges to provide routes or pathways. A further example is Aquapons. This digital learning opportunity is skill based and designed around specific skills where a learner is able to build their own system to develop competencies that are authentic through experiential and problem based learning.

Badge rubrics can be competency based and use standards against criteria that an assessor or group of assessors agrees upon. The criteria are usually associated with standards or levels of achievement for the assessment. When assessing a badge claim or issuing a badge based on guidelines a rubric can be used to indicate evidence of mastery, emerging skills and the application of knowledge and skills-in-use. A badge rubric can demonstrate the levels of achievement based on gradations or levels of being 'in-evidence.' Examples of rubrics to support badge design and criteria include the AAC&U VALUE rubrics and ForAllRubrics, a Rubric and Badging Platform for Teaching and Learning (https://www.forallrubrics.com).

5.2 Portfolios and Digital Badges

The understanding and use of eportfolios for evidencing learning through a curated collection has now historically coincided with the development and growth of digital badges. Traditional portfolios have a long history in higher education and lifelong learning, and are continuing to gain prominence in disciplines which demand evidence of attainment of professional standards across a range of capabilities. Digital portfolios are composed of artifacts and evidence that when curated with experiential reflection provide a narrative or representation of learning, often containing examples of communication, problem solving, collaboration, leadership, life experiences, and writing, as well as images, documents, and audio and video files. Portfolio assessment is most often learner driven, which drives and emphasizes metacognitive development (e.g. learning how one thinks and learns and becoming expert in self-regulation of learning). The portfolio approach is often used in capstone projects or Work Integrated Learning (WIL) opportunities.

In summary, a digital portfolio:

- is a collection of digital resources that provides evidence of a student's learning in the course and program
- provides examples of both formal and informal learning activities in the course and program
- is student-centered, student-owned and managed
- provides a space or a repository for a collection

and in comparison with digital badges, a symbiotic relationship is evident (Coleman, 2015). When curated into collections and published as artifacts or as evidence of a claim, a collection of badges serves many of the same functions as a digital portfolio; for example becoming aware of performance quality, creating authorship and ownership of learning, developing professional identity, and communicating with a variety of audiences for different purposes. Badges are artifacts of what Gee (2000, 2008, 2011) calls identity kits, which are ways of being in the world. This is to be a "kind of person, in a given context" (Gee, 2000, p. 99) and is framed by discourses, practices and processes that support and reinforce that identity. Badges moreover, are signifiers of specific kinds of professional identities or dimensions of professional identity.

An often-overlooked dimension of digital badges is that of projected identity. James Gee's (2003) concept of projected identity is useful in framing an understanding for the ways in which badges project specific identities. Gee's concept of projective identity is within the context of online video games and refers to the ways in which a player constructs an identity for their avatar. Gee describes this as approaching 'project' from two perspectives; "to project one's values and desires onto the virtual character" and "seeing the virtual character as one's own project in the making, a creature whom I imbue with a certain trajectory through time defined by my aspirations for what I want that character to be and become." (p. 55). Acquiring and publishing badges can be viewed in the same way. The person constructs a specific identity by carefully curating a collection of badges that create the narrative of an identity.

Inherent in evidence-based digital badge assessment is making transparent a standard of performance that can sometimes go unnoticed or unwarranted in marks and grades. For example, designing the system to support learners to improve the quality of their work and demonstrate such in order to earn a badge can provide more information to students and to stakeholders who read the badge. An example is a badge eco-system developed at the University of Michigan, to help "provide evidence of prior knowledge, growth in a particular domain, and provide opportunities for previously nebulous or intangible competencies to gain greater clarity" (Mblem, 2015, NPN). Purdue University Passport is an example of the evidence-based portfolio approach. d of performance that can sometimes go unnoticed or unwarranted in marks and grades. For example, designing the system to support learn portfolio platform integration and partnerships with badge providers has risen and the potential for portfolios of evidence in Digication, PebblePad and Pathbrite provide the opportunity for badges to be curated as artifacts in the portfolio as well as in badging the portfolio.

The symbiotic relationship of digital badges and eportfolios is evident in professional identity formation. Because portfolios are owner-designed and presented, they demonstrate applied learning while making learning more meaningful and making new learning connections. Endorsing and verifying this curated form of learning with digital badges is a form of warranting achievement that validates identity as a learner or professional. As Professor Alex Ambrose from University of Notre Dame reports, "the great benefit of the intersection of ePortfolios and badges is showcasing of relevant co-curricular experience students have at their institution. Digital badges aren't used as certificates and they don't bear credit, however, they along with portfolios provide recognition of student achievement, which can have deeper representation than transcripts or more traditional records. Badges integrated with eportfolios are as seen as supplement to the transcript or resume. Students are usually not obligated to update their eportfolios every semester, so integrating digital badges with eportfolios encourage students to do so" (Grush, 2015, NPN).

Digital badges properly designed as integrative with good teaching and learning processes can provide learners with a framework to see the applied connections in their evidence of knowledge, skills and experience. The integrative learning VALUE rubric developed by AAC&U can be used to design appropriate program based badge standards. The University of Notre Dame, Deakin University, University of Michigan, Purdue University, University of California at Davis and Peer-to-Peer University have designed their systems to capture the "learning path: Recognizing granular skills so that learners can build portfolios that represent their own interests and goals" (Finkelstein, Knight & Manning, 2013, p. 9).

5.3 Building Self Regulation and Autonomy with Digital Badges

The symbiosis between digital badges and eportfolios continues through the development of developing skills of self-awareness and metacognition. Badges issued as evidence to be included in curated digital portfolios, for example, can be iterative in nature (e.g. renewed through practice over time) and curated through an ongoing process of critical reflection to develop critical thinking and self-management attributes. The University of Central Oklahoma Student Transformative Learning Record (STLR), for example, was developed to support students to realize the value of learning these important skills, by providing "many opportunities for them to practice and then reflect upon the importance of these skills to their success in life and work" (2015, NPN).

The co-design of badges, criteria and standards can support 'dialogue and interaction about assessment processes and standards' (Boud, 2010) to develop autonomy and skills in making judgments. An example of co-design with students and educators of curriculum and badges is the Hive Toronto project. Hive received a grant from the Office of the Privacy Commissioner of Canada to design and develop a curriculum to 'prototype badges to enhance privacy education for teens in Canada'. Co-designing assessment and digital badges offer learners the ability to design the sequences of the learning activities, see the capabilities and standards that are expected and develop confidence in the discipline.

5.4 Internal Badges

Inward facing or internal digital badges do not necessarily following the OBI metadata infrastructure and not meant to openly share beyond a limited context, but serve a number of important purposes in promoting learning, motivating practice, gamifying achievement, and creating openness and transparency of progress in assessment. In asynchronous assessment, for example, instead of being required to take an exam at a pre-determined time, for example, learners can seek out the assessment on their own time and be issued a badge or badges as feedback and incentive. Another example, driven by data and analytics is the badge issued via stealth assessment. Automatic badges for evidence of participation have been a source of division amongst badge issuers, which can be resolved by becoming internally focused. This approach addresses the concern of some critics of these badges that automated badges may decrease the value or currency of badges in the wider higher education ecosystem. Also countering this perspective, Grant (2014) points out that "Our assumptions that participation does not warrant a credential says more about our belief that learning is limited to performance on exams and assignments" (p. 23). An automatic badge acts as a *digital identifier of evidence for both the individual and the community*, indicating an achievement of professional learning for a range of stakeholders. Automatic badges such as these can be used to demonstrate attitudes and noncognitive capabilities such as persistence and goal orientation, as well as skills and knowledge when curated in collections.

There are also many other possibilities for learning analytics and designing learner pathways through automated internal badges. For example, internal badges can be awarded automatically to provide immediate feedback in a learning management system or digital learning experience. This can create reinforcement of learning in less formal environments. "To ensure that all [learners] can engage equitably with assessment tasks, the implicit rules and expectations around what is required for success need to be made accessible to students" (Boud, 2010, NPN). At the Australian National University the INSIGNIA project sought to explore the skills and knowledge in research education, specifically research integrity. Research students have a range of training and skill development to undertake as well as autonomously self-directing their research agendas. To make these skills explicit to the learner and the research community, and demonstrate both preparation and experience at intervals of learning, digital badges were successfully utilized to track, recognize and assess progress.

The early issuance of internal badges in a course can provide both the incentive and support to acquire the skills and knowledge learners "need for learning, including those of assessment" (Boud, 2010, NPN). The SUNY Metaliteracies Project involves librarians, disciplinary faculty members, and instructional designers from several State University of New York (SUNY) institutions who have designed a clear path and learning ecology for learners who work towards four top badges: 'Master Evaluator, Producer and Collaborator, Digital Citizen, and Empowered Learner'. Each learner "must explore a substantial number of topics, and provide evidence of their mastery of each area, as well as their ability to synthesize and extrapolate from what they have learned and created" (Metaliteracies, 2015, NPN). As Boud confers, "early engagement in manageable assessed tasks to build confidence" (2010, NPN) is required as learners build their confidence in the profession and develop their identities.

Internal badges also appear in many games, such as 'Campus Quest' created at Curtin University (https://www.campusquest.com.au/) to engage rural and indigenous pre-collegiate students in learning about university life. In this example, badges and levels are used to reward and mark progress in the game toward the ultimate goal of increasing engagement and game completion. Exchange value beyond the game is not expected, but badges help open new opportunities and activities within the game experience.

6 Conclusion

Digital badges represent an opportunity to rigorously re-consider evidence-based teaching, learning and assessment and to re-connect formal higher education systems to the wider world of professional, informal and lifelong learning, with a focus on building the individual capabilities of each learner.

This chapter outlined three primary roles of digital badges for supporting learning journeys in higher education: bringing *visibility and transparency* to learning, teaching and assessment; *revealing meaningful, identifiable and detailed aspects of learning* for all stakeholders; and providing *a new mechanism to recognize skills, experience and knowledge* through an open, transferable, stackable technology framework. The possibilities for these roles were explored in terms of distinct phases of the journey of learning referred to as 'paths into learning,' 'paths during learning' and 'lifelong learning pathways.' Team-based development processes and design decisions for motivating learning were reviewed based on cases stemming from a national study of micro-credentialing in Australia, and the chief instructional approaches and impacts were briefly outlined, with examples from the cases.

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Appendix: OBI Metadata Structure

The structure of the OBI metadata is open to anyone who is interested, and is composed of two essential parts, the experience in h projectcess of 'baking' the assertion into the .png file. The assertion (Table 7.4) is in a sense a container with five required elements (uid, recipient, badge, verify, and issuedOn) and three optional elements (image, evidence, expires). The expected data types for all the elements have further specifications, and these are then used in the baking process to ensure a trustworthy exchange of a badge between an issuer, a recipient and the public consumer or reader of the badge.

Table 7.4 Badge assertion

Property	Expected type	Description
uid	Text	Unique Identifier for the badge. This is expected to be **locally** unique on a per-origin basis, not globally unique.
recipient	IdentityObject	The recipient of the achievement.
badge	URL	URL that describes the type of badge being awarded. The endpoint should be a BadgeClass
verify	VerificationObject	Data to help a third party verify this assertion.
issuedOn	DateTime	Date that the achievement was awarded.
image	Data URL or URL	URL of an image representing this user's achievement. This must be a PNG image, and if possible, the image should be prepared via the Baking specification.
evidence	URL	URL of the work that the recipient did to earn the achievement. This can be a page that links out to other pages if linking directly to the work is infeasible.
expires	DateTime	Thus indicates when and if a badge should no longer be considered valid.

Table 7.5 Badge class

Property	Expected type	Description
name	Text	The name of the achievement.
description	Text	A short description of the achievement.
image	Data URL or URL	URL of an image representing the achievement.
criteria	URL	URL of the criteria for earning the achievement. If the badge represents an educational achievement, consider marking up this up with LRMI
issuer	URL	URL of the organization that issued the badge. Endpoint should be an IssuerOrganization
alignment	Array of AlignmentObjects	List of objects describing which educational standards this badge aligns to, if any.
tags	Array of Text	List of tags that describe the type of achievement.

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Part II
Technological Frameworks and Implementation

Chapter 8
Badging Platforms: A Scenario-Based Comparison of Features and Uses

Sonja Dimitrijević, Vladan Devedzić, Jelena Jovanović, and Nikola Milikić

Abstract In the multitude of available badging platforms, it is not easy to choose the appropriate one to support a particular badging (sub-)system. A list of badging features provided for a certain platform is often not informative enough and might even be misleading. To address this problem, this chapter provides a deeper insight into current features of badging platforms, and thus help one make more informed decision when choosing a platform for a specific application case.

To this end, we first examined relevant academic literature and other relevant resources, and based on the obtained insights, developed several scenarios describing typical forms of interaction with badging systems. Then, we identified functional requirements related to each scenario and established a set of comparison criteria for badging platforms, namely supported scenarios, variety of badging features, and supported badging and teaching/learning practices. Using these criteria, we reviewed, analyzed and compared features of six selected badging platforms.

The study results reveal feature-wise differences as well as differences in supported practices among the platforms, many of which are the result of different origin and focus of the platforms. In addition, the results offer a realistic insight into the capabilities of the selected platforms.

Keywords Badging platforms • Badging technology • Open badges • Features • Comparison

1 Introduction

A number of badging platforms compliant with the Open Badges Infrastructure (OBI) (The Mozilla Foundation, 2014a)—an open technical specification for digital badges—have appeared over the past few years. These platforms offer features

S. Dimitrijević (✉)
Mihailo Pupin Institute, Belgrade, Serbia
e-mail: sonja.dimitrijevic@pupin.rs

V. Devedzić • J. Jovanović • N. Milikić
University of Belgrade, Belgrade, Serbia

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primarily for issuing, earning, collecting, displaying and/or sharing Open Badges, i.e., OBI-compliant digital badges. However, features offered by different badging platforms can differ significantly, not only regarding targeted functional requirements, but also regarding the way the same requirements are implemented.

The study presented in this chapter aimed to provide a deeper insight into features of state-of-the-art badging platforms that would be of benefit to designers and implementers of badging systems when choosing a platform for a specific application case. It should also provide Open Badges community with a realistic insight into the capabilities of the selected set of platforms.

The study had two phases: (1) identification of functional requirements for badging platforms, and (2) comparative analysis of the selected platforms. Functional requirements were identified through the scenarios that were defined based on academic literature and other relevant resources. The study addressed the following questions: (1) How well do the features of state-of-the-art badging platforms fit the identified badging scenarios? (2) How do the examined badging platforms differ with respect to their features? (3) Are there some unique features offered by individual platforms?

Section 2 introduces software support for Open badges and provides an overview of badging platforms. Section 3 identifies the key functional requirements that badging platforms should fulfill. Section 4 presents the conducted study; after defining the study questions and describing the method, the study results are presented. Section 5 discusses the results of the study with respect to the comparison criteria and concludes the chapter.

2 Badging Platforms

A short introduction to software support for Open Badges[1] (OBs) (Sect. 2.1) precedes an overview of OBI-compliant badging platforms (Sect. 2.2).

2.1 Software Support for Open Badges

Different sorts of Web and mobile applications provide support for OBs. These include primarily applications that allow for creating, issuing, managing, displaying and sharing badges. While some applications provide only one group of these features (e.g., tools for creating OBs such as OpenBadges.me (2015)), other are more comprehensive, i.e., cover various groups of features.

Systems that cover most of the state-of-the-art features for working with OBs are called badging platforms. Such platforms usually allow for connecting and using

[1] In this book chapter, the term "badge" denotes an Open Badge (OB), unless stated otherwise, and will be used interchangeably with "OB".

various tools and services from different providers that may suit different needs. They are generally cloud-based systems, easily accessible to individuals and organizations (e.g. Credly (2015)). Specific features may vary by platform though.

Software support for OBs also includes ‘passive displayers’, e.g., Web sites, blogs and social networking sites that are capable of displaying badges even without originally providing specific features for badges. This is possible thanks to manually embedded code, plugins, widgets, and/or external tools (integrations) that provide features for displaying badges (e.g., WPBadgeDisplay (2012), Treehouse Badges Widget and Shortcode (2015)) or for managing badges that are displayed elsewhere (e.g., BadgeWidgetHack (2013) and Badge Bridge (2015)).

2.2 An Overview of OBI-Compliant Badging Platforms

The full potential of a badge-based ecosystem could not be realized without open standards for badges-related interactions (Pearson Education, 2013). Gathered around Mozilla, HASTAC and the MacArthur Foundation, a broad community of collaborators provided the first version of Open Badges specification in March 2013. In addition, the Open Badges Infrastructure (OBI) that implements this specification was introduced.

The Open Badges specification enables portability of digital badges and interoperability of badging systems, i.e. ability of badging systems to exchange digital badges and use the information stored in the exchanged badges. According to the Center for Scholarly Technology (2013), “Mozilla Open Badges is beginning to emerge as the standard framework for documenting and distributing badges”. It can therefore be expected that badging platforms increasingly embrace Open badges.

OBI arguably plays the leading role in development of badging environments. Guided by open software strategies, OBI provides an infrastructure for creation, issuance, verification and collection of Open badges (Gibson, Ostashewski, Flintoff, Grant, & Knight, 2015). According to the Mozilla Foundation (2014a), Open infrastructure technology is aimed to support independent badge issuers and displayers by providing them with the metadata specification, APIs, verification framework, Backpack and software tools.

Mozilla Backpack (2015) is a software system that primarily allows for collecting badges from different sources. In addition, it allows for managing, displaying and sharing the collected badges. Backpack is a free service for anyone to use.

Other software systems based on OBI are: Mozilla BadgeKit (2015a) and Mozilla Discover (2015a). BadgeKit involves a Web app and an API. The BadgeKit Web app provides support for design, creation, and issuance of badges. It also supports badge application management. The BadgeKit API is intended to handle “the data associated with published badges” (Mozilla BadgeKit, 2015b). Issuing organizations are expected to host their own BadgeKit instance.

Mozilla Discover is a prototype tool that should enable learners to browse careers and badges, follow career pathways of real-world professionals or design their own customized career pathway from scratch. Pathways are visualized as editable maps, which include progress indicators and notes (Mozilla Discover, 2015b). Mozilla Discover is available as a free service.

A number of OBI-compliant badging platforms have emerged in recent years. Platforms can differ in many important aspects including: if they are open source or proprietary, freely available or not, independent or based on another platform, cloud-based or locally hosted, provide open-access API or not, etc.

Proprietary platforms (e.g., Acclaim (2015) and Badge List (2015)) are more numerous than open source platforms (e.g., BadgeOS (2015) and P2PU (2014, 2015)). Some proprietary platforms (e.g., Credly (2015) and Open Badge Factory (2015)) provide open-access APIs that can be useful for badge system developers. On the other hand, open source platforms might require plugins for advanced features that are neither open source nor free (e.g., BadgeOS). While proprietary platforms are usually cloud-based systems, open source platforms are typically available for local hosting (e.g., BadgeOS and P2PU) and sometimes as cloud-based systems (e.g., P2PU).

Pricing and accessibility of cloud-based badging platforms may differ from platform to platform. Some cloud-based platforms are free (e.g., P2PU) and other are commercial. Many commercial cloud-based platforms also offer free accounts, although limited in features (e.g., Credly and Open Badge Factory) or are reserved for public learning groups (e.g., Badge List), schools and education programs (e.g. Makewaves (2015)). There are also cloud-based platforms that started free and open for all users, but subsequently excluded badge creation and awarding features from free offer (e.g., Passport (2015)).

In contrast to 'independent' platforms, there are also badging platforms that are based on WordPress (e.g., BadgeOS and WP Badger (2014)) or integrated into e-learning management systems (e.g. Moodle (Moodle, 2014), Totara (Totara, 2015) and Canvas™ (Canvas, 2015)).

A good starting point for getting familiar with OBI-compliant badging platforms is the Badge Alliance Wiki page with concise descriptions of the selected badging platforms (Badge Alliance, 2015). There is also an online spreadsheet document that presents a comparison of the basic issuing features of some badging platforms (Open Badges Community, 2015). Many platforms comprise features for design, creation and issuance of badges, as well as features for gathering, displaying and sharing of (usually internally collected) badges. In some cases these two groups of features are separated: Mozilla's OBI-based platform includes BadgeKit for badge issuing and Backpack for storing and sharing of badges; similarly, Discendum's Open Badge Factory is focused on badge issuing, whereas Open Badge Passport (2015) offers features for storage and sharing of badges.

By drawing upon the information available at the aforementioned Web resources and Websites of individual badging platforms, this book chapter provides a deeper insight into a broad set of categorized badging features aiming to reveal the supported practices and capabilities of the state-of-the-art badging platforms.

3 Towards Functional Requirements for Badging Platforms

The scenarios briefly presented below were defined to help us identify the requirements that need to be fulfilled by the state-of-the-art badging platforms if the badging interactions envisioned or identified by scholars and practitioners are to be implemented. The scenarios were identified based on academic literature, case studies, project reports and personal experiences reported by educational researchers and practitioners.

General badging scenario. A general scenario of interacting with Open Badges and therefore with badging platforms includes the following steps (Goligoski, 2012):

1. A badge issuer establishes badge earning criteria, and then designs, creates and offers badges.
2. Users earn and collect targeted badges.
3. Users decide which badges they want to display/share on personal profile pages, social networking sites, community hubs, etc.
4. People interested in the badge holders' background go through their public/shared badges and learn more about the achievements of interest by examining the information exposed by the badges.

As this general scenario shows, badging platforms should primarily provide support for different badge issuing, earning, presenting and (re)viewing procedures and practices. Starting from the general badging scenario, we have developed and elaborated several more specific scenarios of interacting with badging platforms. We have also identified additional scenarios that are currently not widely deployed but have been suggested in the literature.

The scenarios helped us identify and categorize functional requirements for badging platforms. They also indicated the role and the potential contribution of different badging features in different scenarios. In addition, the scenarios provided a general guideline for the review of badging platforms. A detailed elaboration of the scenarios is available in the supplementary document (Dimitrijevic, Devedzic, Jovanovic, & Milikic, 2015a). Here, for each of the scenarios, we present a short description and list the identified functional requirements. We plan to periodically revise the scenarios in a separate document by adding new scenarios and potentially extending the existing ones (Dimitrijevic, Devedzic, Jovanovic, & Milikic, 2015b).

S1—Offering badges. In order to make badges available for issuance, a badge designer/creator designs/creates badges and badge pathways in accordance with the selected instructional design. This scenario suggests the following functional requirements:

- creation of badge visual representation (The Mozilla Foundation, 2014a, 2014b)
- creation of badge templates (Willse, 2014)
- creation of different types of badges (The Mozilla Foundation, 2014a, 2014b)
- creation of badges based on predefined badge types
- use of badge metadata (defined by OBI)

- creation of higher level badges, which require some specific badge or badges of certain types as prerequisites, or aggregate multiple lower level badges (The Mozilla Foundation, 2014a, 2014b)
- unlocking new privileges and responsibilities (Rughiniș, 2013; The Mozilla Foundation, 2014b)
- documenting/charting badge pathways (Casilli, 2013; Devedzic & Jovanovic, 2015; The Mozilla Foundation, 2014b)
- badge alignment to learning standards (Rehak & Hickey, 2013)
- 'publishing' badges, i.e., making badges available for issuance

S2—Badge discovery. In order to discover learning/badge opportunities, a learning opportunity seeker searches for, reviews and compares the learning opportunities. To support this scenario, a badging platform should satisfy the following functional requirements:

- search for badge opportunities (Devedzic & Jovanovic, 2015; Goligoski, 2012)
- review and comparison of badge opportunities (Escribano & Moreton, 2014; Gibson et al., 2015; Joseph, 2012)
- selection of a badge opportunity

S3—Applying for badges. In order to apply for a badge, an applicant registers for the badge opportunity, and works on meeting the badge criteria and obtaining the evidence that the badge criteria were satisfied. Depending on the assessment process, the applicant might be required to submit the evidence for the achievement or the content/resources based on which the evidence could be generated (e.g., responses for online assessments).

The main functional requirements derived from this scenario are:

- registration for a badge opportunity (Smithsonian Center for Learning and Digital Access, 2014)
- applying for a badge by submitting the evidence or artifacts
- additional ways of applying for a badge
- support for different forms of submissions

S4—Awarding badges. For a badge to be awarded, assessors (individual assessor, multiple assessors or software system) first assess the badge application; this assessment provides the ground for an issuer to approve or reject the badge application, and to inform the applicant of the decision. If the badge awarding is approved, the issuer makes the badge available to the badge earner.

The main functional requirements derived from this scenario are:

- support for automated assessment such as "stealth assessment" or online assessments (P2PU et al., 2012; The Mozilla Foundation, 2014b)
- support for self-assessment (Blom et al., 2013; The Mozilla Foundation, 2014b)
- support for multiple assessors (P2PU et al., 2012)
- support for peer assessors (P2PU et al., 2012)
- support for different sources of evidence of the achievement (other than badge applicant's submission) (Grant, 2014; Higashi, Abramovich, Shoop & Schunn, 2012)

- use of the assessment tools from the badging platform
- automated badge awarding (The Mozilla Foundation, 2014b)
- manual badge awarding
- digitally signing badges
- informing the applicant of the decision
- making a badge available to the earner
- reporting

S5—Management of and reflection over collected badges. In order to track his/her progress and to improve awareness of his/her self-improvement goals, a badge applicant collects, organizes and reflects over the badges, preferably with the aid of visualizations. This scenario suggests the following main functional requirements:

- collecting badges earned within the platform (Glover, 2013)
- importing badges earned elsewhere
- organizing badges into collections
- additional ways of organizing badges
- personal dashboard populated with data and metrics related to badges (e.g., badges earned, badges applied for, requests for and responses to peer assessments, etc.) (Charleer, Klerkx, Santos Odriozola, & Duval, 2013)
- visualizations of badges and data related to badges (Charleer et al., 2013)

S6—Displaying and sharing badges. In order to present his/her achievements to the public, a badge earner tailors the badge display and displays or shares his/her badges. Accordingly, the main functional requirements for a badging platform are:

- tailoring the badge display (Otto, 2015)
- displaying badges on a personal page within the platform
- tailoring posts for social networking sites (Otto, 2015)
- sharing badges on social networking sites (The Mozilla Foundation, 2014b)
- pushing badges to Mozilla Backpack
- providing code to embed badges on Websites
- permissions management

S7—(Re)viewing a badge earner's achievements. In order to get familiar with or to verify a badge earner's achievements, a badge consumer views/examines the badge earner's overall achievements, exposed e.g. in his/her public profile or digital portfolio, as well as individual badges of interest. A badge consumer might previously conduct search to discover earners of some specific badges or to find a particular badge earner.

The main functional requirements derived from S7 are:

- user-based search
- badge-based search (Catalano & Doucet, 2013; Knight, 2013 via Ostashewski & Reid, 2015)
- (re)view of a broad picture of the badge earner's experience (Otto, 2015)
- (re)view of individual badges (Otto, 2015)
- evidence validation (Otto, 2015)

4 Feature Comparison of Badging Platforms

The authors of this chapter have conducted a study aimed at uncovering whether and how different state-of-the-art badging platforms implement the functional requirements identified through the scenarios (Sect. 3).

4.1 Study Questions

The study was driven by the following questions (Qs):

- Q1: How well do the features of state-of-the-art badging platforms fit the scenarios (S1–S7) presented in Sect. 3?
- Q2: How do the examined badging platforms differ with respect to their features?
- Q3: Are there some unique features offered by individual platforms?

4.2 Method

To answer the study questions, the study included a review of the selected set of badging platforms. The review was focused on examining the features of badging platforms in order to reveal whether and how differently they implement the identified functional requirements, and therefore how well they fit the scenarios (Sect. 3). The functional requirements for badging platforms were identified through the scenarios describing prominent interactions with these systems. We recall that the scenarios were defined based on academic literature, case studies, project reports and personal experiences reported by educational researchers and practitioners.

To select the badging platforms for the study, we considered the resources provided by Badge Alliance (2015) and Open Badges Community (2015), and reviewed Websites of individual badging platforms.

The following criteria guided the selection of badging platforms for the study:

- the number and variety of features
- availability for review
- compliance with OBI

Based on these criteria, the following badging platforms were selected:

- BadgeList
- BadgeOS
- Credly
- ForAllRubrics
- Open Badge Factory + Open Badge Passport
- Peer 2 Peer University (P2PU)

The process of reviewing each badging platform involved the following steps: creating at least two accounts (issuer and earner account), consulting the available documentation, and examining the platform's features following the scenarios.

The following criteria were used in the comparative analysis of badging platforms:

- supported scenarios
- variety of badging features
- supported badging and teaching/learning practices

4.3 Results

The study has resulted in a comprehensive comparison of the selected badging platforms based on the identified functional requirements. The results of the comparison are summarized in several tables available online (Badging Platforms, 2015). Since features are added and changed over time, we intend to keep these tables current by periodically reviewing features and updating the tables accordingly. We would kindly ask the Open Badges community members to get involved and help us in this effort by revising the tables based on their knowledge of and experiences with the badging platforms.

In the following, we present an analysis of the results according to the study questions (Sects. 4.3.1, 4.3.2 and 4.3.3). The analysis refers to the results initially obtained in the period July-August 2015, and revised in November 2015. These results are available online in a read-only document (Dimitrijevic, Devedzic, Jovanovic, & Milikic, 2015c).

4.3.1 Q1: Support Offered by the State of the Art Platforms to the Elaborated Scenarios

All of the inspected badging platforms cover the most basic functional requirements derived from S1. In other words, they support basic features for the creation and publishing of badges. Most of them support badge metadata defined by OBI beyond the basic sets. However, explicit documenting/charting of badge pathways is not (yet) supported. As for the other functional requirements from S1, few of the platforms fulfill them. Each of the following four functional requirements were implemented by only two of the platforms: creation of badge templates and creation of higher level badges (BadgeOS and Open Badge Factory), creation of badges based on predefined types of badges (BadgeOS and ForAllRubrics), and unlocking new privileges and responsibilities (Badge List and P2PU). Finally, the functional requirement of badge alignment to learning standards is fulfilled only by ForAllRubrics.

The leading functional requirement from S2, search for badge opportunities, is fulfilled by half of the inspected platforms (BadgeOS, Open Badge Factory and

P2PU). None of the platforms supports review and comparison of badge opportunities as S2 envisages. Almost all of the badging platforms (except Open Badge Passport) support selection of a badge opportunity, although there are notable differences regarding the way in which multiple badge opportunities are exposed to badge applicants (Sect. 4.3.2).

When it comes to S3, all the platforms enable badge applicants to apply for a badge by submitting the evidence. Support for different forms of submissions is also found in all of the platforms, although there are obvious differences among the implemented features (Sect. 4.3.2). In addition, five of the platforms (all but P2PU) allow their users to apply for a badge without a submission, whereas three platforms (BadgeOS, Open Badge Factory and P2PU) provide additional ways of applying for a badge. Only Badge List supports registration for a badge opportunity.

The basic functional requirements derived from S4 and therefore steps of S4 are well supported. Namely, all of the inspected platforms allow issuers to approve/decline a badge application and to manually award one or more badges. All of them also support informing the applicant of the decision and making the badge available to the earner(s). Support for different sources of evidence of an achievement is provided by four of the platforms (BadgeOS, Credly, ForAllRubrics and P2PU).

Furthermore, several functional requirements from S4 are fulfilled by half of the platforms: automatic badge awarding (BadgeOS, Credly and Open Badge Factory), allowing badge earners to create and award badges (Badge List, Credly and P2PU), and reporting (Credly, ForAllRubrics and Open Badge Factory).

The functional requirements from S4 related to assessment are rarely fulfilled. Support for peer assessors is provided by ForAllRubrics and P2PU. Only BadgeOS supports automated assessment, while only Badge List provides support for multiple assessors. Furthermore, auto-assessment and use of assessment tools from within a badging platform (rubrics and checklists) are supported only by ForAllRubrics.

Although the Web resource (spreadsheet) provided by Open Badges Community (2015) indicates that some of the inspected platforms support signing badges digitally, we could not verify the claim. By reviewing the platforms and going through the online documentation, we only found that Open Badge Passport supports import of signed badges from Mozilla Backpack.

As for S5, all of the inspected platforms allow badge earners to collect badges earned within the platform. This implies that badge earners can also view and inspect the collected badges. Half of the platforms provide personal dashboard (Credly, OBP and P2PU). However, the other functional requirements related to S5 were implemented just by a few platforms. Only a couple of platforms support: importing badges earned elsewhere (Credly and Open Badge Passport), and additional ways of organizing badges (ForAllRubrics and Open Badge Passport). The remaining two functional requirements are fulfilled only by one of the platforms: organizing badges into collections (Credly), and visualizations of badges and data related to badges (ForAllRubrics).

S6 is better covered than the previous scenario. All of the inspected platforms enable badge earners to display badges on personal pages within the platform. All of the platforms except BadgeOS also allow badge earners to share badges on sev-

Table 8.1 The number of implemented functional requirements in relation to the number of functional requirements identified for a specific scenario

	Badge list	BadgeOS	Credly	ForAllRubrics	OBF OBP	P2PU
S1—Offering badges	4/9	**5/9**	3/9	**5/9**	4/9	3/9
S2—Badge discovery	1/3	**2/3**	1/3	1/3	1/3	**2/3**
S3—Applying for badges	**4/4**	3/4	3/4	3/4	3/4	3/4
S4—Awarding badges	6/14	8/14	8/14	**9/14**	6/14	7/14
S5—Management of and reflection over collected badges	1/6	1/6	**4/6**	3/6	**4/6**	2/6
S6—Displaying and sharing badges	5/7	1/7	**7/7**	5/7	5/7	5/7
S7—(Re)viewing a badge earner's achievements	3/5	2/5	3/5	3/5	**5/5**	**5/5**

eral social networking sites (such as LinkedIn, Twitter, Facebook, etc.) as well as to push badges to Mozilla Backpack. Users of BadgeOS, however, can send badges to Credly and use its sharing features thanks to connection between these two platforms. Moreover, there is a third-party add-on "Open Badges Issuer Add-on" that enable users of BadgeOS to directly push badges to Mozilla Backpack.

The basic capabilities in tailoring the badge display (custom titles and/or messages) are found in ForAllRubrics and Open Badge Passport. Similarly, the basic capabilities in tailoring posts for social networking sites (titles and/or messages) are found in ForAllRubrics and P2PU. According to its documentation, Credly Enterprise edition supports configuring display and sharing components encompassing badges. However, we could not review these features. Furthermore, half of the platforms provide code to embed badges on Websites (Badge List, Credly and P2PU) and support permissions management over badge display (Badge List, Credly and Open Badge Passport).

When it comes to S7, all of the badging platforms support (re)view of a broad picture of the badge earner's experience, as well as (re)view of the individual badges. On the other hand, user-based search and badge-based search are supported only by Open Badge Passport and P2PU.

Table 8.1 shows the number of functional requirements implemented by a badging platform in relation to the number of functional requirements identified for a specific scenario. The best results are presented in bold.

4.3.2 Q2: Feature-Wise Differences Among the Badging Platforms

We analysed the features with the most variations in implementation.

S1—Offering badges. Most of the inspected platforms allow for creation and upload of badge visual representations, except for Open Badge Factory and P2PU, which only allow for upload of badge images.

Creation of badge templates is supported by BadgeOS, while Open Badge Factory allows for the creation of criteria page templates and reuse of badge images. In addition, both Open Badge Factory and ForAllRubrics allow for copying and using copies of existing badges as starting point for creation of new badges.

ForAllRubrics supports the creation of badges based on predefined badge types (e.g., badges associated with rubrics or badges associated with checklists). Moreover, this requirement can be supported by BadgeOS through the use of the BadgeStack add-on (levels, quest badges, quests and community badges).

Creation of higher-level badges is better supported by BadgeOS than Open Badge Factory. It supports meta badges, unlocking higher-level badges, and involving lower-level badges into various steps required for earning a badge. Open Badge Factory only provides meta badges that are automatically awarded when all or minimum number of the required badges are earned.

Badge List and P2PU support unlocking new privileges and responsibilities to badge earners. More precisely, they allow earners of some specific badge to become 'badge experts' with privileges to assess evidence and award that badge.

S2—Badge discovery. Search for badge opportunities is supported by BadgeOS, P2PU and Open Badge Passport. P2PU allows for browsing of badges by the following categories: New, Popular, Featured and All. In addition, it provided search for courses that are typically associated with badges. Thanks to the BadgeOS customization capabilities, administrators can embed a keyword-based search field into multiple Web pages, thus enabling search for badge opportunities. Open Badge Passport also provides search for 'shared' badge opportunities. However, the search results only lead to information about a badge and its current recipients, not allowing users to apply for the selected badge. It seems that from within Open Badge Passport (Web page "Apply for a badge"), users currently can apply for just one badge opportunity offered by Discendum.

All of the other badging platforms support some way(s) for a badge applicant to view multiple badge opportunities and to get to the badge application form of the selected badge.

Users of Badge List can view and register for badge opportunities within a learning group of which they are members. Similarly, users of ForAllRubrics ('learners') can view and apply within their class(es) for badges shared by teachers.

Since users of Credly can be both issuers and badge earners, badge applicants can view and select a badge opportunity from the user profile pages. However, a badge applicant is expected to know the link to the issuer's profile page or to have the issuer on his/her contact list. In addition, Credly provides an overview of 'new members' and 'newly given' badges.

BadgeOS provides a page for each badge opportunity accessible through links (e.g., in main menu) or search. Badge opportunities within P2PU can be accessed through courses or browsing of badges.

S3—Applying for badges. Support for different forms of submissions varies from platform to platform. Credly requires different forms of submissions to be attached separately (link, text, photo, video, and audio). However, it does not provide a feature that would enable badge creators to restrict submission format(s).

BadgeOS, ForAllRubrics and Open Badge Factory allow for submission of files not specifying the expected format(s). BadgeOS also supports textual entries. ForAllRubrics supports writing self-reflections, while Open Badge Factory supports textual entries and responses on multiple-choice questions. Similarly, Badge List supports upload of images and provides fields for inserting free text, Web links, Twitter links and code. For submission of computer source code (such as HTML, Java, Javascript, Python, etc.), a syntax-aware code editor is provided. Finally, P2PU expects so-called project submissions that include image, title, project URL, steps taken, lessons learned and tags.

Additional ways of applying for a badge that are supported involve: being nominated (BadgeOS), enrolling in a course (P2PU) or applying for a badge without submission (Badge List, ForAllRubrics and Open Badge Factory).

S4—Awarding badges. In addition to standard forms for awarding of badges manually, Credly and ForAllRubrics provide features for creation of claim codes and claiming badges based on these codes.

Informing applicants of the decision regarding their badge applications is supported via notifications (Badge List, BadgeOS, Credly and Open Badge Factory) and/or emails (Badge List, Credly, Open Badge Factory and P2PU).

ForAllRubrics and P2PU provide different support for peer assessors. ForAllRubrics enables self and peer-assessment with the help of rubrics. On the other hand, 'learners' in P2PU can request feedback from peers for the submitted projects.

Different sources of evidence of an achievement are found in most of the platforms. In addition to applicants' submissions, issuers' submissions (Credly and ForAllRubrics) and testimonials (BadgeOS, Credly and ForAllRubrics), lower-level badges (BadgeOS and Open Badge Factory), points and site/community activities (BadgeOS) are found as sources of evidence. Moreover, Badge List and P2PU enable submission assessors to write feedback.

Several forms of automated badge awarding are supported: automated approval of badge applications (BadgeOS, Credly and Open Badge Factory), "stealth badges", i.e., badges given for criteria unknown to the earner and, therefore, coming as a surprise (e.g., conducting site and community activities), completing steps, earning points (BadgeOS), and awarding of higher-level badges (BadgeOS and Open Badge Factory).

We also noticed differences among the platforms regarding the reporting features they provide. Credly free edition provides basic reports that contain information on badges created, claimed and issued. According to the Credly documentation, premium and enterprise editions provide 'enhanced reports and analytics' that allow for tracking of achievements and badge activity by user.

ForAllRubrics has rich reporting capabilities focused on assessment data. Class, student and item-level reporting, as well as standards-wise reporting with support for the Common Core, distinguish this platform. However, ForAllRubrics is lacking simple reports on badge applications and badges issued. Open Badge Factory provides basic reports on badge applications, badges created and issued, as well as on badge earners. It also provides filters for a couple of reports (on badges and earners), as well as simple ring charts. Thanks to communication with Open Badge Passport, Open Badge Factory reports on badges ‘accepted’, ‘in Passport’ and ‘not received’. Finally, BadgeOS can support basic reporting thanks to the commercial “BadgeOS Reports Add-on”.

S5—Management of and reflection over collected badges. Import of badges earned elsewhere, specifically from Mozilla Backpack, as well as upload of badges, is supported by Badge Passport. In addition, Credly allows for collecting badges pushed from BadgeOS and displaying badges from Mozilla Backpack.

Additional ways of organizing badges, supported by some of the platforms analysed, include creation of pages, although primarily aimed for sharing (ForAllRubrics and Open Badge Passport) and search by badge name, permissions and tags (Open Badge Passport).

S6—Displaying and Sharing badges. Permissions management over a badge display boils down to the selection of a visible/hidden option (Badge List), i.e., public/private option (Credly). Open Badge Passport offers the third option: a badge display can be shared only with registered users. The other badging platforms do not provide these features. Personal profiles in P2PU are public, while personal profiles in BadgeOS are private. Learners’ portfolios in ForAllRubrics are visible to teachers.

S7—(Re)viewing a badge earner’s achievements. Features for (re)view of a broad picture of the badge earner’s experience show subtle differences among the platforms. Credly provides an overview of awarded and earned badges by categories, as well as selected badges from Mozilla Backpack. BadgeOS supports browsing the earned badges by categories. Open Badge Passport allows registered users to order shared badges and digital CVs/small ePortfolios by name and date. P2PU offers an overview of badges, projects and feedback. Badge List shows a user’s learning groups and related badges, as well as the feedback the user has received. Finally, teachers within ForAllRubrics can (re)view a learner’s portfolio (which successively shows his/her activities, submissions and the badges earned), as well as badges on badge and timeline views. Only teachers can enable and share link to public ‘badge board’ that displays the course-related badges of all students in a class. In addition, learners can create custom pages (‘shares’) and share their links with badge consumers.

As for evidence validations, Badge List enables a badge creator to set the evidence visibility (public, private/only visible to group members, or secret). In contrast to the other platforms, evidence is not visible within BadgeOS, but it can be shared via Credly.

4.3.3 Q3: Unique Features of Individual Platforms

Badge List is intended for learning groups. The recognized user roles are: group admins, badge experts, badge awarders (admins and experts or experts only, depending on badge permissions) and group members. Badge experts are group members who have received the corresponding badge and possibly unlocked privileges to award it. By joining a group, learners become able to earn badges related to the group.

This is the only of the examined platforms that supports registration for a badge opportunity. After ‘joining a badge’, learners can submit pieces of evidence of an achievement in their own pace and track the progress on personal progress log.

Badge List provides support for multiple assessors following its specific practice. After the learner submits evidence for all of the badge requirements, Badge List automatically initiates an assessment/validation request to all agreed badge awarders. However, the request can be withdrawn at any time. One or several badge awarders post their assessments, either positive or negative. The “validation status”, which determines whether the badge is awarded, represents the difference between the number of positive and the number of negative assessments. Moreover, negative assessments can later be turned positive and vice versa, potentially resulting in the badge being awarded or even withdrawn.

When awarding a badge, issuers can write feedback to the badge earner. Interestingly, the feedback is called ‘endorsement’ and is published on the badge earner’s public profile.

BadgeOS provides the greatest variety in support for automated badge awarding (completed steps, earned points, site activities, earning lower-level badges) and consequently for different sources of evidence of an achievement.

BadgeOS supports automated assessment. Specifically, it supports “stealth badges”. These badges can be triggered by site activities such as logging in to the site and publishing posts and comments. In addition, there is “BadgeOS Community Add-on” that provides additional assessment triggers: profile updates (e.g., updating profile information), social actions (e.g., writing an activity stream message), group actions (e.g., creating a group) and discussion forum actions (e.g., adding a new forum topic).

The lack of some basic features (e.g. sharing and reporting features), BadgeOS can overcome with add-ons and ‘integrations’ (e.g., with Credly) and, thanks to the extensible Wordpress platform, it can be extended to provide some additional features.

Credly is the only one among the analysed platforms that supports organizing badges into collections, as well as (re)viewing badges organized in this way. It also supports sharing badges automatically on the specified social networks.

Unfortunately, we could not review potentially advanced features (e.g., multiple account managers and roles, configuring display, sharing and other components, advanced reports and analytics, etc.) since they are not available in the free edition.

Thanks to its open API, Credly can be connected with a number of third party platforms and tools (e.g., BadgeOS, Moodle, Drupal, etc.).

ForAllRubrics is intended for classes. The primary roles are teachers and students.

ForAllRubrics stands out by implementing several functional requirements. It enables the use of assessment tools within the platform, specifically rubrics and checklists, thus offering support for peer- and auto-assessment.

Interestingly, the same rubric or checklist can be used multiple times for different activities set by a teacher. Rubrics can be imported from a file system.

Moreover, ForAllRubrics provides the so called ‘Creative Commons Library’ with search capabilities that allows teachers to search for and use items (rubrics, checklists and basic badges) created and shared by other teachers.

It also supports assignment of learning standards to ‘rubric items’, i.e., to badges. A badge/rubric creator can select one of the offered standards from a number of categories (e.g., Common Core: ELA/Literacy, etc.).

ForAllRubrics is the only of the analysed platforms that supports custom badge images for issued badges and provides a visualization of badges, namely an interactive badge timeline.

Integration with systems like PowerSchool and Edmodo is possible, as well.

Open Badge Factory (OBF) and Open Badge Passport (OBP) distinguish several user roles: admin, creator, issuer, recipient/earner and consumer. Accordingly, OBF organizes features into issuer, creator and admin tools. OBP is intended for earners and consumers.

OBF allows for creation of custom badge application forms with arbitrary form fields (text input, file upload, checkboxes, etc.), where creators can also add instructions for issuers and applicants. For each application form a link is provided for issuers to share.

OBF also supports creation of criteria page templates, application form templates, and email message templates. Additionally, it provides the multistep forms for creation and issuance of badges, enabling the use of templates.

OBF offers plugins for Moodle, Totara LMS and Optima learning platforms, as well as for Mahara e-Portfolio.

OBP stands up by allowing badge earners to build and share digital CVs or small ePortfolios.

P2PU is open, community-centered, and focused on peer learning. It enables creation of courses, which encompass instructions, calendar, announcements, and other content, as well as badges. Members can apply for badges by enrolling in courses and can satisfy badge criteria by completing assignments and/or submitting a ‘learning project’. A learning project is an artifact that includes the project URL, as well as a learner’s reflection on learning experience (steps taken and lessons learned).

As expected, P2PU provides support for peer feedback on learning projects. Positive feedback from peers can be also one of the badge criteria. By earning a badge, an earner becomes the ‘expert’ with privileges to award that badge.

P2PU allows experts to write distinctive qualitative feedback on submitted projects. Feedback includes “Kudos” “Questions” and “Concerns”.

5 Discussion

This section concludes the chapter by discussing the findings of the study from the perspective of the comparison criteria introduced in Sect. 4.2.

5.1 Supported Scenarios

All of the defined scenarios (S1–S7) are at least partially supported by the analysed platforms. The well covered scenarios are S3—Applying for badges, S6—Displaying and sharing badges (with exception of BadgeOS, which depends on the integration with Credly) and S7—(Re)viewing a badge earner's achievements. However, features for tailoring of badge display and posts for social networking sites (S6) to suit needs of different badge consumers, if provided, are pretty basic. If more advanced, these features would offer more effective support for both S6 and S7 (primarily regarding (re)view of badges). In addition, most of the platforms would benefit from supporting user- and badge-based search, which is currently provided only by two of the platforms (Open Badge Passport and P2PU).

In general, the platforms provide basic features for offering (S1) and awarding badges (S4). However, more advanced features related to these scenarios, currently supported only by few of the platforms, could greatly benefit the badging community. These include creation of badge templates and higher-level badges, unlocking new privileges and responsibilities, badge alignment to learning standards (S1), as well as assessment support features (S4). Although, there are a lot of expectations regarding documenting/charting badge pathways (S1), currently none of the platforms supports this feature. We also could not confirm that signing badges digitally (S4) is supported by any of the platforms.

Support for S2—Badge discovery and S5—Management of and reflection over collected badges leaves plenty of room for improvement. Only a couple of the platforms support search for badge opportunities and none of the platforms supports review and comparison of badge opportunities. This can be justified for platforms intended for classes and young students such as ForAllRubrics, in which teachers might be expected to guide students towards badges. In other cases, S2 and S5 were probably given low priority initially, since their importance grows with increasing number of badges. When a badging system offers a large number of badges to earn, the support for S2 and S5 must be much better.

5.2 Variety of Badging Features

A great variety of features is observed for the following largely implemented functional requirements: support for different forms of submissions (e.g., files of (un) specified format, links, textual entries, etc.) (S3), selection of a badge opportunity (e.g., from within learning groups, courses, search results, etc.) (S2), and support for different sources of evidence of an achievement (e.g., applicants' submissions, issuers' testimonials, site activities, rubrics, lower-level badges, etc.) (S4).

Considerable differences among the examined platforms are found in features for additional ways of applying for a badge (e.g., badge applications with no submissions, and indirectly, enrolment in a course and nominations) (S3). As for awarding badges, two of the platforms stand out by supporting claim codes in addition to forms for manual awarding. More subtle differences are found in permissions management over a badge display (S6) and (re)view of a broad picture of the badge earner's experience (S7). Furthermore, the largest diversity of features for each of the following two functional requirements are provided by a single platform:

- automatic badge awarding (stealth badges, i.e. site and community activities, completing specific steps, earning points, as well as meta badges by BadgeOS) and
- reporting (specific reports based on assessment data by ForAllRubrics).

5.3 Supported Badging and Teaching/Learning Practices

Supported badging and teaching/learning practices, as well as the variety of badging features (described in Sect. 5.2), largely depend on the origin and/or the purpose of the platforms.

Badge List, which is intended for learning groups, supports multiple assessors, as well as the specific badge awarding and revoking practices. Similarly, P2PU, a platform for peer learning, supports peer assessors and the practice for requesting peer feedback. These two platforms also allow learners to unlock privileges for assessing evidence and awarding a particular badge by earning it.

Being the rubric and badging platform free for teachers and their classes, ForAllRubrics unsurprisingly supports the use of rubrics and checklists from within the platform. Thanks to these assessment tools, it enables self- and peer-assessment.

BadgeOS stands out by supporting stealth badges triggered by site and community activities. This and other practices characteristic for BadgeOS (such as allocation of points for badges and awarding higher level badges based on points earned), are enabled by the flexible underlying Wordpress platform.

Credly and OBF/OBP, which target a wide range of users, are not distinctive by supported teaching/learning practices like the other platforms.

The state-of-the-art badging platforms are still young systems trying to offer more than basic features and to position themselves as best as possible in the rising ecosystem of badging tools and platforms. The percentage of overall fulfillment of the identified key functional requirements is not high and currently ranges from 46 to 60.5 % depending on the platform. It could be higher though, thanks to the potential of some platforms to integrate with other badging and learning platforms and tools. However, feature-wise differences and differences in supported practices among the badging platforms can be quite pronounced, inter alia, because of origin and focus of the platforms. Whether being focused on specific learning environments or not, the platforms offer features, of different levels of maturity, that at least partially support the defined scenarios.

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Chapter 9
Adopting Digital Badges in Higher Education: Scoping the Territory

Brent G. Wilson, Crystal Gasell, Aysenur Ozyer, and Len Scrogan

Abstract Digital badges are often contrasted with transcripted degrees and certificates traditionally offered by universities. As micro-credentials, badges may be issued by employers and professional organizations, and accessed and used flexibly by learners. But universities themselves can also appropriate badging practices. In this chapter a university-based research team reports efforts to plan and launch badging systems at two levels: (1) individual course level; and (2) program level. Each level is presented as a mini-case, showing its role in contributing to eventual school-wide adoption. Then university-wide infrastructure and support is discussed.

In the first case, an early-adopting instructor developed badge options for students certifying specific and specific skill mastery within individual courses. This initial work led to broader scale plans within a master's plan of study as described in case two. The role of early adopters is highlighted—individuals committed to the concept and willing to iteratively try things out and develop systems over time. Then the badging infrastructure is described, including the instructional support system and plans to increase faculty awareness and participation as a means to increase adaption university-wide.

The concluding section reflects on the potential impacts of badging practices, including outreach, marketing, and within the university. Badges can help academic programs move away from seat-time models and toward a competency-based approach to curriculum. Finally, recommendations are offered for beginning and growing badge programs within a university setting—from infrastructure to implementation.

Keywords Digital badges • Competency-based education • Micro-credentialing • Higher education • Learning assessment

B.G. Wilson (✉) • C. Gasell • A. Ozyer • L. Scrogan
University of Colorado Denver, Denver, CO, USA
e-mail: brent.wilson@ucdenver.edu

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1 Introduction

Interest in digital badges has grown in recent years, largely as a result of two converging developments:

- Tools and platforms are becoming available, drawing on Web, authentication, and analytics technologies
- Alternative learning resources and experiences are growing, including Web-based/open resources and communities and self-directed learning activity

The vision is appealing: break up the monopoly long held by degree-granting universities and let people control and document their own learning, with the help of badging systems that document learning accomplishments. Traditional credentials will always have value, but badging systems, as a disruptive innovation, will fill a small niche initially, then grow over time and lead to big changes in how we certify initial training and continuing career development.

In this story the university is the big guy set up for a fall—Goliath—and the badging approach is the upstart (David). Goliath watches stupidly as the world changes around him. Like every story however, it is partly true and partly fiction. Universities, can, of course, *become* badge issuers. Like a full-service bank, the university could include a full range of services and offerings, from formal degrees and certificates to smaller scale badges offered for internal or external use. Because of their established credibility, universities enjoy initial competitive advantage in the present landscape, with badges in early stages of development. Long term, a broad-based approach to university credentialing would include digital badges, strengthening ties to learners, employers, and professional support providers. At least in theory, badges could play a role in *strengthening* traditional degree programs and solidifying the university as a credentialing institution.

Even so, universities face significant challenges in integrating badges into their systems and practices. Inertia is one: the mindset that says badges are a nuisance and a sidebar issue. Another is the resource question: badges are one more item that busy professors and administrators may not have time for. Even when people understand the need and are willing to get engaged—where do we start, and how do we proceed? This chapter is offered to those university personnel who are sympathetically inclined toward badges, interested and willing to get started—but unsure about next steps. We offer short reports of our experience with digital badges at two levels: course level badges and program level badges. Then, we take a look at the infrastructure and support needed to grow badges at these two levels. We walk through our development efforts from inception to the present day, with a peek at the future. We examine our efforts as a case of technology adoption or diffusion of an innovation (Rogers, 2003). We also reflect on ways that badges can potentially affect the university's mission and identity. In the long run badges may indeed exert a disruptive influence on universities.

The basic concept of badges is fairly simple. Digital badges are micro-credentials certifying some kind of competency or skill. The credential is issued by an organization or entity, which assesses and certifies the learning. The badge is assigned to the learner through an authentication system, and then accessed and used by the individual learner for various purposes—e.g., assembling a skills portfolio, or presenting evidence of competency for job searches of performance appraisals. Because of badging systems like Mozilla's Open Badges, widely and freely available to users, universities do not require expensive and elaborate systems to get started. An instructor or program outreach may issue a badge without too much trouble. So what's the problem?

A few "problems" do arise within the higher-education context:

- *Getting noticed and supported at the startup level.* Badges are new to higher education and there are few early adopters to collaborate with. Support at administrative levels could vary for small scale implementations.
- *Sharing a consistent vision for badges across levels (admin, academic programs, university).* Badges can be seen as a nuisance or there may be a lack of infrastructure to scale implementation.
- *Developing a system that is simple and usable enough for students, faculty, and academic programs to commit to.* Current badging platforms for enterprise use do not have all the functionality needed to scale, including full learning management system integration.
- *Supporting users (programs, faculty, and students) in their effective use of badges.* Resources for staffing, training, and support can be a limiting factor during implementation.
- *Aligning badge systems to the larger mission of the university and strengthening academic programs and degrees.* Badges potential has not been fully exposed in the mainstream, administrators may be weary about dedicating funding and resource to a university wide initiative.
- *Poor assessment threatens the validity of badges.* Badges may be awarded even if competencies or skills are not fully demonstrated. This can affect an institution's reputation and the validity of badge ecosystem.

These issues are common with any new practice, and must be attended to if the innovation is to succeed. These issues will surface in the two cases reported below (individual and program level). In an effort mitigate problems, infrastructure and support are identified as a key factor in scaling badges at a university. Considering scale, future plans for badging is explored. The chapter's concluding section re-examines the issues and offers recommendations for launching a badging system within the university setting.

2 Research: An Overview

According to the Mozilla Foundation and Peer 2 Peer university (2012), a badge is "a symbol or indicator of an accomplishment, skill, quality or interest." Technically, a badge is an image file linked to metadata that justifies and validates the badge, with information about the badge, the issuer, what the owner had to do in order to earn the badge, expiration date etc. Consequently, the value of the badge is closely related to the assessment and evaluation strategies as well as the recognition, credibility, and acceptance of the issuer. The badge's strength increases if the issuer and issuing process are accepted within an ecosystem of certified people and institutions (Gibson, Ostashewski, Flintoff, Grant, & Knight, 2013).

Digital badges are seen as a way to recognize and accredit the informal learning. Learning happens anywhere and anytime in today's world and the fact that we can only recognize very little of it has been a controversial subject. A study conducted in Los Angeles, California has found that the majority of the general public's science learning occurs outside of school and specifically occurs through personal learning needs and interests (Falk, Storksdieck, & Dierking, 2007).

The increased popularity of standardized testing in the United States ignited conversations on alternative ways to measure, assess and recognize skills and learning. At the 2007 Presidential Address for the American Educational Research Association, Eva Baker warned educators about accountability and validity issues of tests, which are often assumed to be valid and useful for a wide range of uses and decisions. One of the responses she recommended was to rapidly develop a set of merit badge Qualifications that reflect twenty-first century needs. Each Qualification would be a validated experience obtained inside or outside the school. Qualifications would then be aligned with integrated goals, tasks, learning experiences, and tests performance requirements (Baker, 2007).

Badges have been used by different online and gaming platforms such as Foursquare, LinkedIn, and Xbox, but a white paper released in 2012 by the Mozilla Foundation and partners spurred interest in educational uses (Mozilla Foundation & Peer to Peer University, 2012). They argued that badges could signal more granular and specified learning to employers and other stakeholders, and help motivate learners to achieve and share credentials and accomplishments. The paper also asserted that badges would help personalize learning by giving control to the learner of their own learning pathways. This is in keeping with Dan Hickey's (2012) lists four main functions of badges:

- *Recognizing* learning
- *Motivating* learning
- *Assessing* learning
- *Evaluating* learning

2.1 Recognition

Recognition is the most known and referenced function of digital badges. Their potential lies in their ability to recognize and accredit the informal learning (Hickey, 2012; Mozilla Foundation & Peer to Peer University, 2012). We already are capable to recognize learning happens in formal environments. Badges offer an opportunity to acknowledge the great deal of learning that happens in everyday life, outside of school (Werquin, 2010).

2.2 Motivation

Motivation issues surrounding badges have generated some controversy among educators. In some cases, imposition of external rewards has been found to compete with the intrinsic enjoyment of learning tasks (Deci, Koestner, & Ryan, 1999). Today, many badge skeptics criticize the use of badges as motivational tools because of the risk of decreasing learners' motivation to learn. Nieswandt and Shanahan (2008) found that students' motivational levels needs to be scaffolded, particularly in student-centered learning and teaching contexts. In their study, when participants viewed the task as an authentic and meaningful experience, participants' motivation to get through the course and get the credit shifted to one where they started desiring to learn and understand the material. Similarly, Abramovich, Schunn, and Higashi (2013) found that badge earning could be driven by motivation and badges could positively affect learner motivations. They have also found that extrinsic motivators can have negative influence on learning. Their study has showed that different badges affect different learner motivations. They warn educational badge designers to consider their learners' ability and motivations when choosing the badge types they want to include their curricula. Resnick (2012) further indicates that because students may focus on collecting of badges rather than learning the material, it is critical for badge designers to think carefully about the motivational consequences of the badges so that the badges will not become the central focus of motivation.

2.3 Assessment and External Uses

Sullivan (2013) cites that while nearly every state in the US requires the completion of at least one social studies course to graduate from high school, only nine states require any kind of learning assessment in social studies. Clearly a need exists, she argues, for "multidimensional assessments that can accommodate a diverse set of learning environments (e.g. formal classrooms, after-school programs, community settings), and the long developmental trajectories that can span beyond a single grade year or classroom" (Sullivan, 2013, p. 1). As an alternative way of assessment Baker (2007) and Davidson (2011) indicate educational badges can serve as summative, formative, and transformative assessment of learning. Summative assessment functions certifies that learning indeed occurred; formative assessment point to paths toward improvement; and transformative assessment looks for deeper changes to identity and social role. To ensure validity, badge designers need to carefully consider different goals for their badges, validation concerns, and the philosophical, theoretical assumptions behind them (Hickey, 2012).

Badges as recognition of learning and skills may help prospective employers and admissions committees when choosing between applicants. However, Diamond and Gonzalez (2014) indicate that it is still too soon to use badges as signaling techniques because without external authorities such as school or district administrators to recognize the badges, it will be very difficult to sustain a badge system. In their competency-based professional development (PD) program for teachers, only a small percentage of the participants sought out badges specifically. Teachers were not interested in gaining badges; they were rather drawn to the project because of the high quality content. The authors call for study of the broader contexts in which the badges will exist (Diamond & Gonzalez, 2014).

Similarly, Põldoja and Laanpere (2014) used digital badges in a hybrid course and examined student perceptions of badges. According to the interview findings, students appreciated the way badges recognize and allow them to present their achievements; however, they also admitted that they see little value in badges because they were narrowly used in only one course as an experiment, not used broadly. All respondents agreed badges could have a larger potential if they become an integral part of the higher education assessment system. Both of these studies show that in order for badges to be able to gain popularity, they must be accepted by broader contexts. Higher education is of course one of the broader contexts in which the badge systems may exist. In principle, badges have the potential of weakening and disrupting the authority of higher education institutions and changing the current credentialing system completely (Gibson et al., 2013; Olneck, 2012; Sullivan, 2013).

Davies and Mehta (2011, as cited in Olneck, 2012), assert another possibility, claiming that higher education institutions will adopt "accommodation logic" and incorporate badging systems within their own boundaries. That accommodation logic serves as the conceptual basis for the present chapter, as we explore our local efforts to integrated badges into established higher-education structures.

2.4 Evaluation

Hickey (2012) points out badges' potential to help evaluating the learning using the meta-data. He argues that the researchers can use badges to collect data since badges are able to carry various types of information including hyperlinks to artifacts, testimonials, rubrics, and course descriptions. Compiling the data that badges have, researchers could evaluate the impact of the education that has been given.

3 Badges Within an Online Master's Program

This section reports on our work at the University of Colorado Denver's graduate program in Information and Learning Technologies (ILT). We first describe efforts within a master's program—badges offered within individual courses, led by instructor Len Scrogan and reported in Len's voice. Len's work and broader interest within the faculty has led to broader plans for integrating badges into the master's curriculum, reported next.

3.1 Within Courses: Len's Experience

Over the last 3 years, I have been offering digital badges within three different courses, two at the graduate level and one at the undergraduate level. My purpose was fourfold: (1) to explore an assessment technology that had seen an increasing footprint at national conferences in recent years; (2) to distinguish what types of competencies are best represented through the administration of classroom badges; (3) to observe the motivational force of badges or micro-certifications; and (4) to determine what type of student benefits most from classroom-based badges.

Throughout this effort, I anticipated and wrestled with a number of concerns: Will badges be perceived as childish by undergraduates or graduate students? Will perceptions of worth play out differently for students serving in industry, as opposed to educational, settings? How do I avoid trivializing accomplishments, while ensuring authenticity and relevance for each badge earned? Will students export and exhibit their badges to external audiences, or will this experience solely serve as an incentive within the course? What badge types make the most sense? How technically difficult or time consuming will it be to set up and manage badges?

I chose two types of badges for this 3-year experiment: (a) a badge for individual core competencies; and (b) a progressive badge showing mastery and performance over time.

I began by connecting badges to core course competencies, not simply quizzes, tests, or nominal course activity. For example, in a graduate level assessment course, I created a badge for a very difficult competency to master and demonstrate: the ability to construct higher-order-thinking questions for formative and summative assessment purposes. In another graduate level course certifying students for teaching online, I installed and administered two competency-level badges, each with a number of expectations and "moving pieces": first, being able to lead and manage a synchronous training event; and second, creatively designing, leading, and bringing closure to an online class discussion with peers. In an undergraduate class, I chose to shape a performance badge (evidencing self-efficacy, creativity, and curriculum connection in digital teaching/learning) earned through the completion of three progressive and rigorous self-selected projects.

Although I am still very much in the throes of working with badges, I have made a few observations regarding my initial concerns.

- *Will badges be perceived as childish by undergraduates or graduate students?* Initially, badges are perceived as childish by in-service educators and industry folks; graduate students in medical fields often envision a much clearer connection to their work, however; generally, the lowest buy-in is from K12 educators.
- *Will perceptions of worth play out differently for students serving in industry, as opposed to educational, settings?* Most students who show the highest interest in exporting and displaying earned badges are currently in career transition; badges are therefore much more practical and relevant to them. Students in static positions found themselves much less motivated to export or display badges.

However, in general, the majority of students to not use them or export them to professional settings.

- *How do I avoid trivializing accomplishments, while ensuring authenticity and relevance for each badge earned?* It was fairly easy to tie badges to core competencies in the class. By awarding badges for rigorous accomplishment or performances, the students are able to see the relevance.
- *Will students export and exhibit their badges to external audiences, or will this experience solely serve as an incentive within the course?* Based on my experiences, most students did not export or display their badges. However, it appears that badges are a generally new concept to students in the school of education.
- *What badge types make the most sense?* Various badge types (skill-based, competency-based, progressive, jigsaw) are worthwhile, the value of each depending on the competency being performed.
- *How technically difficult or time consuming will it be to set up and manage badges?* Making, managing, updating, and authorizing badges is not without a learning curve or recurring technical challenges. As an emerging assessment technology, this is clearly not for the timid.

3.2 Within a Larger Plan of Study

Len's interest in digital badges is shared by other learning technologies faculty at CU Denver. The MA plan of study is a lean 30 credits, so every credit counts. Collectively, we are presently planning the formal integration of digital badges into MA requirements. Looking back, the planning space for badges has happened within a historical and cultural context of program values and practices, outlined below.

- *Online portfolios*. For more than 15 years, MA graduates have published online portfolios. Portfolios are portals that introduce an emerging professional to the world, through a brief intro and reflection, a résumé, several showcased products and projects, and contact information for further exchanges. By way of their portfolio, students demonstrate their e-learning competency to the world—not just their faculty reviewers. In many ways the portfolio requirement lies at the heart of the educational experience, and reflects a broader competency-based approach within the program, e.g.:
  - *A commitment to sharing*. Like the portfolio, every class results in products of some relevance to the world, that can be shared publicly. Course instructors ask students to publicly share their work on completion, so that other students can review and benefit.
  - *Focus on the here and now*. We want the program to be relevant to students here and now—not just after receipt of diploma. By their second semester, some students take on part-time work that complements their academic load. As they progress through the program they are building a professional

  learning network (PLN), which they need to cultivate throughout their careers and which will assist in their continued growth and development. Students are doing professional work in classes, and building resources and connections from the very beginning of their studies.
  - *Rite of passage*. We stress the program's role in their induction into the e-learning profession. In this sense the portfolio at program's end serves as a rite of passage, signifying their assumption of a new identity as e-learning specialists. Such rites are important symbols of growth and development, and complement the new language and new practices of the professional community.
  - *Credit reflecting work accomplishment*. No academic credit is given for the final preparation of portfolios, although it does represent the comprehensive exam for the MA. Students quickly absorb the program's values and stance toward productivity—credit is given for demonstrable products and accomplishments, not just for seat-time or passing a test. When considering waiver requests for core courses, for example, work products are a key source of evidence.
  - Portfolio requirements and the underlying competencies have been recently revised, to make them even more relevant to workplace realities. Students now prepare a professional portal (which we call a homebase), intended for continuing use, rather than an academic site intended for skills evaluation. The site serves as a demonstration of competency, but only incidentally so. Its main function is to introduce the person to the world and serve as a point of contact and connection with other professionals.

- *Resources for self-direction*. About 8 years ago ILT faculty developed a website called ILT Resources, to serve as an advisement center for continuing students. The goal was a single point of contact for many advisement issues, which would reduce the need for calls and emails about program details. The page includes links to plans of study, course rotation, course descriptions, faculty profiles, portfolio requirements, and other administrative details. Over time a set of content resources was added, under the heading of New Student Orientation. Presently an entire page called Design Methods and Principles consists entirely of links to content resources—papers, primers, tutorials, and videos—presenting basic principles of e-learning and instructional design, intended for beginning and continuing students. These content resources thus become another way for students to control their own professional learning. As needs arise within a course or project, an instructor or peer student may point to a common resource, or students may engage in systematic study of these resources independently. Presently we expect that the content resources are under-used, however—hence the prospective value of a digital badge which could give credit for its greater adoption and use.
- *Flexible advisement*. ILT faculty understand that the role of an MA program is not to see every student jump every hoop—it is rather to help every student get to a point of solid expertise as a professional. To attract the very best students, advisors are keenly appreciate the need for flexibility, to give credit or allow waivers or different paths for students with special talents and expertise.

With these issues in mind, the faculty has discussed the adoption of badges as similar to capstone field experiences at the end, which is required by one program track. If field credit can be given and acknowledged as critically important, then why not a collection of badges signifying high-quality, independent demonstration of skills?

At this point we are planning a *new elective that would be an accumulation of self-study badges*—essentially a self-study option for students. Graduate credit still needs to be purchased, since students cannot go below 30 credits for the MA, per Graduate School rules. Offering the badge elective, with a specific structure for individual self-study badges, will be a small first step toward even greater emphasis on competency-based education. We may never become a fully competency-based program, but the badge elective signifies the value we place on continuing self-directed learning from our students, during and after their participation in the program.

4 School-Wide Infrastructure and Support

An individual instructor could utilize an open source badging platform to issue badges. However, as Põldoja and Laanpere (2014) discovered, badges could have a larger potential if they become an integral part of the higher education assessment system. It may take time before the use of badges become a part of the assessment culture within higher education; however, without a solid IT infrastructure for badging, it is unlikely that badging will be able to make a larger impact.

In her capacity as Manager of Academic Services at CU Online, Crystal Gasell helps support technology integration and online learning at the university. She has led the university's effort to support digital badges, at both technical and instructional levels. The following case takes on Crystal's voice, outlining the university's efforts and progress in this area.

4.1 LMS Integration

The majority of higher education institutions utilize a LMS for course delivery (Browne, Jenkins, & Walker, 2006). Additionally, over the last several years, the definitions of face-to-face, online, and hybrid courses has blurred due to the increasing number of faculty using a learning management system, which was traditionally for the delivery of online courses. The versatility of the systems on the market today afford a high percentage of faculty to adapt the learning management system as their classroom space. The LMS thus acts as a hub of learning with the integration of other tools—plagiarism detection, web conferencing, and test proctoring—resulting in a one stop shop for academic technology. If we want faculty to consider adoption of digital badges, convenient access from the LMS is a critical first step.

Mozilla's Open Badges initiative provides a framework for recording and displaying badges, but lacks the streamlined process of creating and awarding badges attached to individual assignments or outcomes within a learning management system. For example, an instructor or program may wish to issue badges for completing a set of defined outcomes that demonstrates competency of a single skill. Within the LMS, an instructor can set up assignments or entire modules of content that require either a certain grade or completion to show competency. The integration into the LMS includes curating all badges issued by an institution, maintaining records of who issued badges, and what badges were awarded. Therefore, the first step was to investigate badging systems which integrate with our LMS, Canvas.

At the time of publication, two systems existed which provided a native application through an LTI connection with Canvas: BadgeSafe and Canvabadges.

- *BadgeSafe* by Accreditrust offers a fully integrated, self-hosted or paid cloud hosted badging system that allows instructors to issue badges as the course, module, or assignment level. This added granularity provides flexibility to offer smaller credentials within a single course. BadgeSafe allows for badges to be exported to Mozilla's Open Badges or secured issuing of badges through TrueCred, a compliant framework system.
- *Canvabadges* is an integration from Brian Whitmer, founder of Instructure. This self-hosted or shared cloud solution allows instructors to issue badges based on final course grade or completion of a module. The lack of granularity for issuing badges and potential challenges of self-hosting makes this product less appealing at an institutional level. Canvabadges allows for badges to be exported to Mozilla's Open Badges and through global CSS scripts, badges can be displayed on user profiles within Canvas.

Although technical challenges will vary by institution, at my institution, the hardware and services cost of a LINUX server and system administrator was cost prohibitive. Additionally, after an initial pilot, the uncertainty of relying on a shared server solution was also out of the question if our university wanted to adapt badges in earnest. Therefore, we selected BadgeSafe's cloud hosted badging system as our platform for our pilot.

4.2 Implementation

Although an individual instructor may implement badges on his or her own using an open source badging platform, the opportunity to support both programs and the institution's larger mission requires careful planning and creates added complexity and costs.

After selecting the BadgeSafe product, the first hurdle became resource and administration. As the Canvas Administrator, our team is equipped to manage the installation, updates, and basic training for faculty and staff. However, it is unclear who, if anyone, should be responsible for maintaining the awarded badge records, certifying badges for quality, and growing adoption. With guidance from CU Online, a task force will be set up to guide answers for the following questions:

- Who should be able to create/issue badges? Should training be required?
- Who should maintain records of issued badges? Is this necessary?
- Should the institution require certification for quality of badges? If so, who should be the governing group?
- What steps should be taken to grow adoption?
- What type of training should be provided? Should it be mandatory?
- Should graphic design support be offered? If so, by whom?

Beyond administration, the other challenge being faced is inertia around the concept of badging. Without a lot of research pointing to a high value of badges in education, many faculty may be unwilling to devote large amounts of time to the exploration of educational badging. Additionally, faculty like Len, who has experimented with badges might find the efforts and challenges of the technical aspects of badging outweigh the benefits.

5 Future Vision

To date, our startup efforts have been fairly focused through engaging early adapters in small scale badging efforts. The larger potential of badges has yet to be uncovered at our institution. However, we envision a fairly broad role for badges in several critical areas of university work:

- *Outreach to potential students*. Universities market their program not just to high-school seniors planning to stay in the freshman dorms, but to an array of groups; a number of paths are deliberately designed from high school, community college, bachelor's degrees—into various certificate, degree, and licensure programs. Badges offered to these groups can help attract notice and invite people's consideration of university programs at all levels and subject areas.
- *Free or low-risk entry courses*. Many schools are offering MOOCs or low-cost courses as a way for students to "try out" their online fare. Badges offered for free or low-cost courses could be a way to certify learning from these experiences.
- *Continuing professional development offerings*. Professionals may need refresher courses to keep their skills updated or grow expertise in targeted areas. Short of a degree, certificates consist of bundled courses. Short of a certificate, badges may be issued to certify continuing development through shorter or smaller-scale work—conference planning and participation, exams and competitions, community engagement, etc.
- *Partnership with employers and professional organizations*. Digital badges may be part of an agreement made with outside partners such as employers or professional organizations, particularly when academic credit is not seen as central to the purpose or need of the relationship.

Overall these impacts serve to broaden services, strengthen ties, and solidify programs and degree offerings.

Badging initiatives can also impact the mission and identity of the university, e.g.:

- Moving from traditional Carnegie units to a more competency-based model.
- Larger role for competency assessment and multiple, flexible paths to competency
- Greater differentiation based on prior expertise and experience

Historically, these approaches have been left to for-profit institutions and teaching universities; research institutions have been slow to think in terms of differentiation to student needs. Alternative learning resources coupled with badge certifications can begin to apply some pressure to mainstream institutions, to begin accommodating student differences more flexibly.

6 Issues and Recommendations

In the chapter's introduction we outlined several issues facing start-up efforts for digital badges within a higher-education setting. We return to these issues below, with fresh commentary. These thoughts are based partly on direct experience, but also on our plans and expectations for continuing work.

- *Getting noticed and supported at the startup level.* Institutions at the startup level should draw on existing communities of practice and professional networks for support. Additionally, institutions should seek out partnerships with innovative faculty, support staff, and administrators.
- *Sharing a vision for badges at various institutional levels (administration, support, and faculty).* Look for areas of engagement within your school, college, or institution. Examine existing programs and priorities for areas of integration.
- *Developing a system that is simple, usable and drives adoption.* Engage with IT and instructional support staff at an early stage, pilot badges with a willing faculty or program. Fine-tune technical infrastructure before committing to a scaled up model.
- *Supporting users (programs, faculty, and students) in their effective use of badges.* Make badges a formal workload assignment for IT and instructional-support staff. Build and nurture a support community. Meet regularly with users to share new work and grow existing programs.
- *Aligning badge systems to the larger mission of the university and strengthening academic programs and degrees.* This idea needs to the driving force from the start. Support of the initiative needs to be reviewed and supported at multiple levels of administration.
- *Ensuring high-quality assessment for learning and competency demonstration.* As a part of the shared vision, establish a quality standard. Continue to share challenges and methods as a part of an institutional community, as well as with a larger community.

Many of these issues are inter-related, as are the responses. As a startup initiative, digital badges depend on local talent and resources, which are always limited. Change principles and models can provide grounding and serve as a reminder that digital badges are indeed an innovation, potentially "disruptive," requiring some rethinking and new habits of practice.

We offer below a few general recommendations for people within universities who are looking for start and grow badge-related initiatives.

- *Enlist participation at all levels—faculty, program/department, admin, and instructional/technical support*. Successful startups will enlist and engage participation at all levels, with cross-level exchanges particularly valuable in understanding the overall needs of the institution.
- *Give room for innovators to lead—but give support*. People vary in their commitment levels, expertise, and range of influence. Thought leaders within the institution are particularly important, but passionate advocates on the margins can be equally valuable. Following Rogers' diffusion theory (Rogers, 2003), early innovators need room and resources to tinker and explore and try things out, followed by more complete development of programs and support resources. Keeping things simple initially, with minimal bureaucracy and institutional obligation, can create a healthy environment for incubation. A small venture-fund investment in the innovators—perhaps a course buyout for a faculty member, or a special assignment for an instructional-support staff member—can yield significant gains at early stages.
- *Get people working/talking together*. Like all bureaucracies, universities workers tend to suffer from isolation. A digital-badge working team may be drawn from disparate parts of the organization—but that's a good thing. Crossing boundaries and communicating vertically and horizontally can strengthen the team and make the work representative of the university's broader needs. The team should keep the administration informed frequently, with period updates and reports of new accomplishments.
- *Mark and celebrate milestone accomplishments*. The badges team should look for excuses to party and celebrate accomplishments. Good news should be disseminated broadly to different academic units and administrative offices. Awareness of an innovation like digital badges takes sustained effort over time; good news should be at the front of this awareness effort.

Although we see promise in higher education regarding their participation and acceptance of badging, we ultimately return to our concern with being the Goliath—turning our heads and thinking our brute strength and armored tradition will see us through another storm. As badging gains popularity with employers, more organizations offer certifications and alternative methods of credentialing through badging, we will believe we will see more individual faculty, programs, and colleges begin to offer alternatives to the traditional transcript.

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Chapter 10
Passport to Designing, Developing and Issuing Digital Instructional Badges

Timothy Newby, Casey Wright, Erin Besser, and Elizabeth Beese

Abstract This chapter introduces instructional design considerations for digital badges. Designing instructional badges presents unique opportunities and challenges, and proper preparation and planning are necessary for the success of the badge. Passport by Purdue is introduced as a system which integrates digital badges with elements of learning management and content management. Passport combines mastery-based progression through designed instructional tasks, with supplementary embedded multimedia resources and a semi-gamified interface built on a badge metaphor—all culminating in certification by a highly portable, information-rich digital badge. In this chapter, we will offer a tour of Passport as an instructional tool, along with theory-informed guidelines for designing effective learning experiences within such an integrated, digital-badge-based learning system.

Keywords Digital badges • Instructional design • Assessment

1 Introduction

The benefits of the implementation and use of digital badges have begun to be expressed by a number of researchers (e.g., Ahn, Pellicone, & Butler, 2014; Ostashewski & Reid, 2015). From an educational perspective, those benefits have been most often described and explained from the often overlapping perspectives of assessment, motivation, and credentials. From the assessment viewpoint, badges can provide a means for those within formal, as well as informal, learning environments to list the needed competencies to achieve a specific skill or level of knowledge and also the standards by which performance will be compared; to offer corrective feedback on learner performances; and to indicate clearly when a specific level of mastery has been achieved (Bloom, 1971; Guskey, 2007).

T. Newby (✉) • C. Wright • E. Besser • E. Beese
Purdue University, West Lafayette, IN, USA
e-mail: newby@purdue.edu

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From an intrinsic motivational perspective, the structure and sequence of badges can offer users an effective way to capture and review potential learning paths while potentially increasing desires for continued or additional learning (Ostashewski & Reid, 2015; Randall, Harrison, & West, 2013), to set goals (Abramovich, Schunn, & Higashi, 2013), to build confidence in personal performances (Keller, 2010), and to foster a sense of accomplishment (Giannetto, Chao, & Fontana, 2013). Badges may also motivate users from a more extrinsic perspective by increasing their effort invested in a task in order to receive a tangible reward or status symbol of personal accomplishments that can be shown and compared to the performances of others (Ostashewski & Reid, 2015).

Related to the ability to show something tangible for what was accomplished is the benefit of the credentials that are supplied by an open badge's metadata. An open badge is a digital badge that is built using Mozilla's open standard and allows learners to "verify [their] skills, interests and achievements through credible organizations" (Mozilla Open Badges). The metadata allows the open badge to carry important information about the competency requirements of the badge, the authority/organization issuing the badge, and in some cases what precisely was completed to accomplish the badge (e.g., Randall et al., 2013). This embedded information can help an individual show a potential employer or educator exactly what was achieved. As explained by Ahn et al. (2014), "For proponents of badges in education, the potential advantages include providing credentialing which might reflect a finer-grained and nuanced reflection of a person's skills or experience. Badges might then represent a way to improve the information complexity issues associated with traditional credentials such as a diploma. Rather than guessing a person's skills from a single credential, stakeholders can gather a nuanced picture of a person's skills through a collection of smaller credentials" (p. 5).

Viewed from these traditional perspectives of assessment, motivation, and credentialing, open badges have minimally consisted of a list of competencies and associated metadata. As suggested by Higashi, Abramovich, Shoop, and Schunn (2012), educational badges can be envisioned as progressing in size, purpose, and detail. As badge platforms have expanded in capabilities, additional instructional elements can now be included. For educational badges these elements may include added instructions, examples, explanations, demonstrations, simulations, and so forth that would not only assess the user's capabilities, but also provide a platform for users first learning those skills. The badge with such elements then becomes an instructional or learning badge.

Passport™ by Purdue University stands out as a badge development platform that has the capability to *combine* the assessment and certification aspects of digital badges, with several other features more common in learning management and content management systems. Passport has been designed to facilitate mastery progression through scaffolded tasks with auxiliary embedded digital content, in the context of a semi-gamified user interface which draws on a visually-prominent "badge" metaphor, culminating in certification via a portable, transparent, information-rich digital badge.

As such, it represents the marriage of several related trends in educational technology. It allows instructional designers a unique opportunity to bring together the advantages of mastery-based learning management, gamified instruction, content management, and digital badge certification—all in one seamless platform.

Designing instructional experiences with an integrated badge-based platform like *Passport* presents unique advantages and challenges. For example, with the additional consideration of the broad nature of what, where, and by whom instructional badges can be constructed and delivered, it is now important to contemplate some guidelines on how to structure and deliver such badges to ensure their success. In this chapter, we begin by providing a set of prompts and guidelines for those creating open badges that may contain instructional elements. Following the guidelines, we will then outline *Passport*, a badge development platform created at Purdue University. Discussion of *Passport* and its elements will allow one to see the actual process needed in order to create an effective instructional badge. In the final section of the chapter, we will show an example of a specific badge created with *Passport* and highlight the guidelines that were followed in its creation.

2 Badge Development Guidelines

When creating badges with an instructional purpose, are there things that should be considered in order to ensure that the badge is effective, efficient, and appealing as possible? If you desire to develop open digital badges, what are some of the key questions that should be addressed prior, during, and after its development?

2.1 Considerations Prior to Developing the Badge

Similar to planning a successful trip, planning for the badge requires gathering some basic information before starting the actual badge development. Before traveling to a new area, we ask ourselves simple questions such as: who will be traveling? what is the purpose of the trip? what will we encounter as we travel? and how will we know when we get there? Similarly, before embarking on the development of the badge, you should consider the following key questions:

- Who will be accessing and using this badge?
- What is the purpose of this badge?
- Under what conditions will this badge be completed?
- What will indicate the badge requirements have been achieved?

From an instructional design perspective, the answer to these questions are critical as they provide the needed information about the badge's target audience, the overall goal and objectives of the badge, as well as the general expected learning environment. A lack of information from any of these key areas could significantly hinder the effectiveness of the produced badge. For example, understanding your target audience allows the level of the requirements of the badge to be set appropriately so that users are not over or underwhelmed by what they encounter. Review

Table 10.1 Rationales for badge designers

Key questions to be considered	Answering the question provides
Who is the target audience?	• Information on level of language, examples, demonstrations, etc. that should be provided to maximize understanding and motivation.
What is the badge's purpose? Why was this badge created? Of what value does this badge have?	• The goal and objectives of what the badge is to accomplish. • Direction for both the badge user as well as stakeholders such as administrators, parents, co-workers, and peers. • Means to help selection of badge based on the intended purpose.
Under what conditions will this badge be completed?	• Background on the type of environment that will be needed in order for the badge to be successfully completed. • Where the badge will be completed and what will be needed in the environment (e.g., technology) in order to successfully complete the badge.
What will indicate the badge requirements have been achieved?	• The list of competencies that must be accomplished by the user to demonstrate mastery.

Table 10.2 Digital badge worksheet

- Badge Issuer (your name and email address)
- Badge Name and Description
- Target Audience Description (learners)
- Learning Outcomes (what learners should be able to demonstrate)
- Learning Activities (tie directly to Learning Outcomes)
- Required Evidence and Assessment Criteria (what learners will submit and how it will be assessed)

Table 10.1 to see additional justifications as to why these questions are worthwhile for the designers of badges.

As shown in Table 10.2, Wright and O'Shea (2014) have created a worksheet to be completed by the badge developer prior to the badge development. This information will provide the needed background to allow for additional design and development guidelines to be included as the badge is formally created. The worksheet allows badge developers to create their badge outline, and is meant to be used in an iterative process to develop and refine the badge before beginning creation in a badge platform.

2.2 *Considerations* During *Badge Development*

Once the prerequisite information for the badge has been identified and obtained, the actual badge development can begin. To produce reliable results, several additional key considerations should be made. Each of these focuses on elements that can be incorporated within the badge to help ensure user success. Based upon the overall purpose of the badge, some elements need to be emphasized. For example, if the focus of the badge is for the user to learn a new skill or level of knowledge, the key elements may be different than if the purpose is to provide entertainment. Likewise, the elements used to develop intentional learning vary from those when incidental learning is the desired end result. As described by Newby, Stepich, Lehman, Russell, and Ottenbreit-Leftwich (2011), instructional activities are elements placed within a learning experience that help the students to learn. These include elements that help to motivate, orient, inform, practice and apply, as well as assess the learner. Integrated within each of these activities are solid instructional design principles that should be incorporated to ensure overall success of the experience. Many of these same principles should be considered during the badge development process.

Based on the work of Yelon (1996), these activities can be adapted into four general categories: motivation, orientation, information, and application.

Motivational activities focus on getting the user interested in working on the badge and then maintaining that interest by investing the effort needed for its accomplishment. Keller's ARCS model (2010) describes four aspects of motivation (attention, relevance, confidence, satisfaction) that should be considered when developing instructional materials; however, the relevance to badge development can also be readily seen.

Attention deals with making sure the badge users perceive the badge as interesting and worthy of their consideration. Relevance refers to whether the users perceive the badge as meeting some personal need or goal. Confidence is how well the badge users think they can actually accomplish the badge based on personal efforts. Lastly, satisfaction refers to the intrinsic, as well as extrinsic, rewards the users receive from undertaking and completing the badge. Table 10.3 highlights some key questions and potential guidelines and strategies to consider including within the badge to facilitate overall motivation (Keller, 1987, 2010; Newby et al., 2011).

Orientation activities include helping the badge user understand what they have learned or experienced in the past and how that relates to what they will need to know to accomplish the current badge. Orienting strategies help prepare the learner to access and use that previous knowledge to see the relevance of the current badge and be set to work and complete what is to be done. These strategies help to prepare and set the user to learn what the badge offers. Table 10.4 reveals both general questions to consider about incorporating orientation activities and some example design strategies that could be integrated to ensure orientation occurs.

Within each badge, information will be given to the badge user. It may be used to explain background information, guided directions on procedures and applications, presentation of examples, lists of competencies, and so on. How that information is structured and presented can have a significant impact on the efficiency, effectiveness, and appeal of the badge for the user. The badge developer needs to know how ***information activities*** can be used to structure the badge so the user clearly understands, retains, and potentially applies the critical information encountered within the badge. Table 10.5 highlights several key questions and possible strategies that should be considered as one determines how to best present information within the digital badge.

Table 10.3 Motivation instructional activity questions and potential strategies

Key ***Attention*** getting questions to consider	• What can be done to capture and maintain the badge user's attention? • What can be done within the badge to stimulate an attitude of inquiry?
Example strategies to gain and maintain ***Attention***	• Introduce information that appears to contradict the user's past experience. • Include two equally plausible facts or principles, only one of which can be true. • Provide examples, content related anecdotes, case studies, etc. • Vary how the information is provided to the users (e.g., print, graphics, video, audio). • Incorporate humor and humorous analogies to explain and summarize. • Include problem solving activities at regular intervals within the badge. • Give users the opportunity to explore and select various projects, assignments, challenges within the badge.
Key ***Relevance*** producing questions to consider	• How can the elements of the badge be tied to the user's prior experiences and interests? • How can the badge be shown to meet the needs or goals of the user?
Example strategies to increase ***Relevance***	• State explicitly how the badge builds on the learner's existing skills. • Use analogies familiar to the user's past experience. • State explicitly how the badge competencies relate directly to future activities of the user. • Require the user to relate the badge competencies to their future goals. • Integrate those that have already achieved the badge to explain the badge's value in future activities or assignments. • Provide opportunities for the badge user to choose how the badge's key elements are achieved.
Key ***Confidence*** building questions to consider	• What can be done within the badge to help the user build a positive expectation for success? • How will the badge support user's successful completion of the badge's challenges?
Example strategies to increase ***Confidence***	• Include clearly stated goals and objectives of the badge. • Explain clearly how the badge performance will be evaluated. • Organize challenges (learning activities) within the badge on an increasing level of difficulty. Make sure each challenge level is viewed as conquerable. • Help users develop a plan of work that will result in the accomplishment of the badge. • Help users set realistic goals of when and how to achieve the badge challenge levels. • Help users see feedback as needed in order for mastery of the badge competencies to be successfully accomplished.

(continued)

Table 10.3 (continued)

Key ***Satisfaction*** generating questions to consider	• What kind of meaningful opportunities can be included in the badge so users can use their newly acquired knowledge/skills? • What will provide reinforcement to the user's successes with the badge?
Example strategies to increase ***Satisfaction***	• Allow the user to use the newly acquired skills in a realistic setting as soon as possible. • Provide informative, helpful feedback when it is immediately useful. • Provide motivating feedback (praise) immediately following task performance.

Table 10.4 Orientation instructional activity questions and potential strategies

Key ***Orientation*** questions to consider	• What can be included to help the user understand the purpose of the badge? • How will the user connect this badge with his/her previous learning or experiences?
Example ***Orientation*** design strategies	• Highlight the key objectives of the badge and provide an overview/plan of the steps that will be involved in accomplishing each. • Highlight each element of the badge and how it relates to past and future badges the user may encounter. • Have the user complete a self-assessment about previous learning experiences that would be related to the objectives of the current badge. Highlight how the objectives and their past experiences may relate. • Present the learner with a problem, challenge, current issue, etc. and demonstrate how it could be solved by implementing competencies to-be-learned within the current badge.

Application activities should be integrated within the badge to allow the user to actually practice and gain experience with what they have been learning within the badge. These activities focus on allowing the user to make an attempt, receive corrective feedback on their performance, adjust, and make further attempts with subsequent feedback. Badges allow for mastery learning (Mehta, Hull, Young, & Stoller, 2013) and this performance/feedback cycle can be repeated until mastery has been achieved. What is practiced, how feedback is delivered, to what degree can the new skill be transferred, how the skill is assessed, etc. are all important considerations within the application activities. Table 10.6 refers to questions and potential strategies to facilitate the integration of application activities.

2.3 *Considerations* After *the Badge Has Been Developed*

Once information has been received and the skill has been practiced, applied, and assessed, it is important to consider how well the overall objectives of the badge have been achieved. ***Evaluation activities*** need to be considered so the badge can continuously be updated and improved. Did the badge actually accomplish what it

Table 10.5 Information instructional activity questions and potential strategies

Key ***Information*** questions to consider	• What major content must be presented within the badge? How will it be sequenced? What examples need to be included? • How will the badge content be understood and retained by the user? • How will the user come to understand when and why the content will be useful?
Example ***Information*** design strategies	• Sequence the badge content and challenge levels in a logical manner (e.g., simple to complex; easy to difficult; top to bottom). • Integrate the use of aids to facilitate memory of the critical content (e.g., job aids, mnemonics, analogies, metaphors) • Include various cues and references to identify the most important/critical information and to highlight how it relates to previous knowledge. • Use demonstrations to show how the content is effectively and efficiently utilized to address relevant problems. • Integrate a wide variety of examples, cases, simulations, etc. so users can grasp how the content can be transferred and used. • Include prompt corrective feedback that provides users with information in order to augment their learning.

Table 10.6 Application instructional activity questions and potential strategies

Key ***Application*** questions to consider	• How can mastery of the badge competencies be effectively demonstrated? • To what degree will practice using the new knowledge and skill be integrated within the badge? • How will corrective and reinforcing feedback be delivered to the user for his/her performance?
Example ***Application*** design strategies	• Show a variety of example situations and demonstrations of the application of the skills presented within the badge. • Create a performance rubric for assessing the quality of the user's performance and to allow for consistent feedback to be delivered for each application attempt. • Share the performance rubric with the badge user so they know exactly what will be expected. • Provide a variety of opportunities for the badge user to apply the new skills and knowledge, and receive immediate feedback and guidance on the attempts. • Encourage the learner to over-learn by repeatedly performing the new skill in a variety of situations to allow for transfer to occur. • Incorporate collaborative and active learning tasks to encourage badge user interaction and engagement.

was supposed to achieve? How can the effectiveness of the badge be determined? These are important questions that need to be considered in order to ensure its continued improvement and success (see Table 10.7).

This section of the chapter has focused on the guidelines and considerations used in order to create a digital badge that is instructionally sound. These are guidelines and as such are suggestions of what could be integrated to help in the design, devel-

Table 10.7 Evaluation instructional activity questions and potential strategies

Key ***Evaluation*** questions to consider	• To what degree were the objectives of the badge accomplished? • What elements of the badge worked well? • What improvements could be made to the badge to make it more effective, efficient, or appealing?
Example ***Evaluation*** design strategies	• Use a post badge survey and/or interview to question users on what they found most and least effective within the badge. • Have subject matter experts review performances by those completing the badge and point out where performances exceed required levels of performance, meet the required levels, or where improvement is needed. • Set periodic time periods (e.g., once a year, once a semester) to review the badge content and presentation for needed updates.

opment, and implementation process. They should not be viewed as requirements, but as suggestions that may help in certain situations to ensure the success of the badge. In some cases, individual guidelines need to be repeated throughout the badge, in other cases, certain guidelines will not be warranted. In all cases, they are provided to help individuals learn from the information that is encountered within the badge.

In order for the badge to be effective, it is also necessary for those creating the badge to create it in such a way that the information and these needed guidelines can be included. In addition, how the badge is created needs to be completed in a way that is efficient and effective for the badge designer, and efficient and effective for the badge to actually be used. The next section of this chapter will highlight the *Passport* badge development platform and its effective and efficient development system.

3 The *Passport* Badge Development Platform

Incorporating the guidelines listed above with the information that was produced by researching and filling in the Digital Badge Worksheet (see Table 10.2), we are now ready to develop the actual digital badge. A sample list of current platforms that allow for badge creation is included (see Table 10.8). One badge development platform in particular that has been noted for its robustness has been the *Passport* platform created by Purdue University (Randall et al., 2013; Wright & O'Shea, 2014). "*Passport* is a learning and e-portfolio system that uses digital badges to demonstrate user's competencies and achievements." Passport allows the badge designer to create the badge, deliver the badge to the learner, assess the outcomes of the learners' performance of the badge competencies, and award and display the badges that have been successfully achieved.

Table 10.8 Sample list of badge development platforms

Platform	Organization	Link
Passport	Purdue University	http://www.openpassport.org
UC Davis Badges	UC Davis College of Agriculture	http://www.reconnectlearning.org/wp-content/uploads/2014/01/UC-Davis_case_study_final.pdf
Acclaim Open Badges	Pearson publisher	https://www.youracclaim.com/
BadgeForge	Little Bird Games, LLC	http://badgeforge.com/index.php
BadgeList	Knowledgestreem, Inc.	http://www.badgelist.com/
BadgeOS	Wordpress plugin	https://badgeos.org/
BadgeKit	Mozilla	http://badgekit.openbadges.org/
Makewaves	MakeWaves	https://www.makewav.es/

From the badge designer's viewpoint, the creation of a badge within *Passport* can be divided into three design and development sections: general badge information, the badge image, and the challenges. Passport guides the developer through each of these sections.

As shown in Fig. 10.1, as a new badge is being created, *Passport* prompts the developer to include the new badge's name, a short description of what the badge is about, and the learning outcomes that will be accomplished by completing the badge. In addition, the system will prompt to create a customized web link for the badge. Supplemental information the developer needs the learner to access may be included (e.g., attached documents, web links, and instructional videos). The developer can also customize the embedded badge data (e.g., badge issuer information, metadata about the type of badge, user rights, intended use, time requirements), as well as a list of potential subject matter experts who may be contacted to approve specific challenge submissions.

Once this information has been created, the developer is prompted to create the badge image. As shown in Fig. 10.2, a badge image builder is included within *Passport* and the developer can either insert the badge image that has been created outside of *Passport* or create it using the badge builder's image style templates, icons, text fonts, and colors. This image, the short badge description, and the badge title will be what is presented as the link within the learners's portfolio once the badge has been achieved.

With the image created, the developer is then prompted to add challenges to the badge. Challenges are learning activities that allow the developer to present information and instructions to the learner, as well as guidance, suggestions, and examples. Most importantly, within each challenge the developer will list what the learner must do to complete the challenge, how that assignment is to be submitted, and the rubric for successful completion. As shown in Fig. 10.3, the developer is first prompted to select how the learner will be asked to complete the challenge.

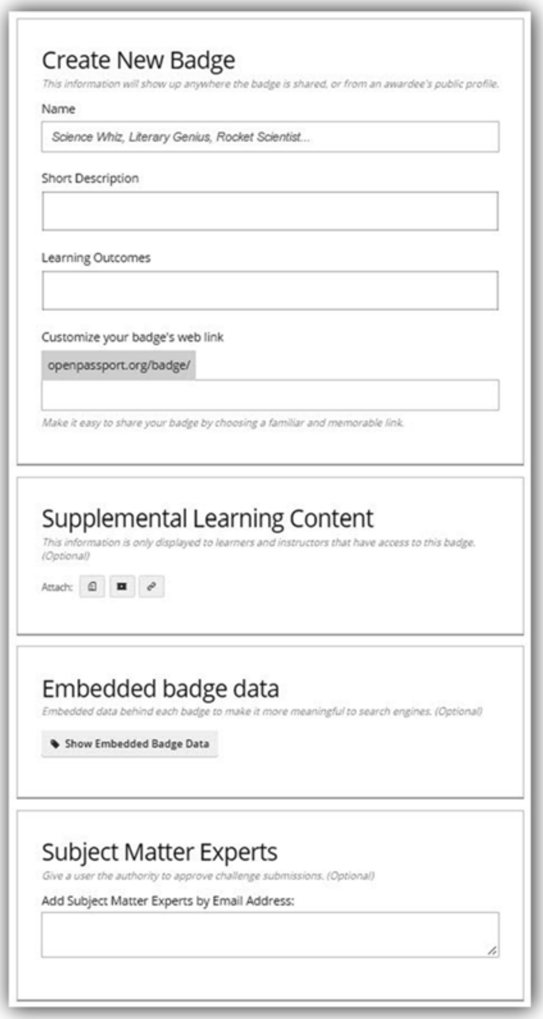

Fig. 10.1 *Passport* new badge creation page

Submissions may include some type of content (written documents, links, video, audio), a built-in quiz or survey, or the ability to work on assignments outside of the platform. An unlimited number of challenges can be created within each badge. This allows for competencies to be presented and practiced in a sequenced fashion (e.g., from simple to more complex) as the learner is presented with each additional challenge.

When the developer selects any of the possible options shown in Fig. 10.3, the developer is prompted to include the challenge's name, list all of the requirements for completion of the challenge, and the learning objectives associated directly with that challenge level. From an instructional design point of view, this list of challenge requirements should also include the criteria (or rubric) by which the performance

Fig. 10.2 *Passport* badge image builder tool

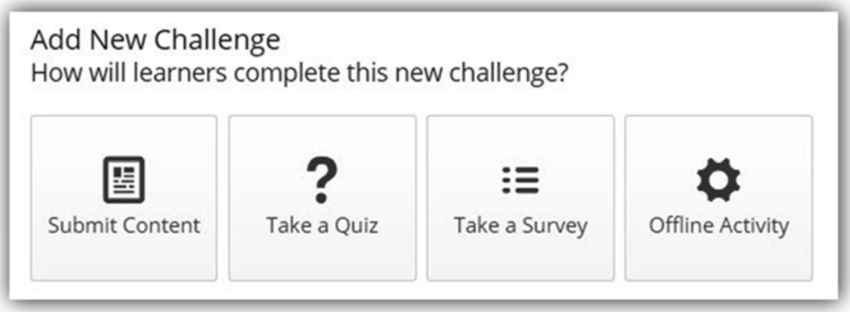

Fig. 10.3 Types of challenge submissions to be added

will be assessed. As shown in Fig. 10.4, when the learner is required to submit content, supplemental information can be presented, as well as the type of submission that is required, and how the submission will be scored. At this point the developer is also prompted to include "Supplemental Learning Content." Generally, this is used to introduce the challenge to the learner and explain the purpose behind the challenge and how it fits in with previous learning, other challenges, and the overall badge requirements. This can also include embedded videos, links, or attached documents. Finally, the developer also selects how the submission will be completed by the learner (e.g., open text, links, files, or videos), due dates (if applicable), and if the challenge requires the instructor to assess and rate the level of performance.

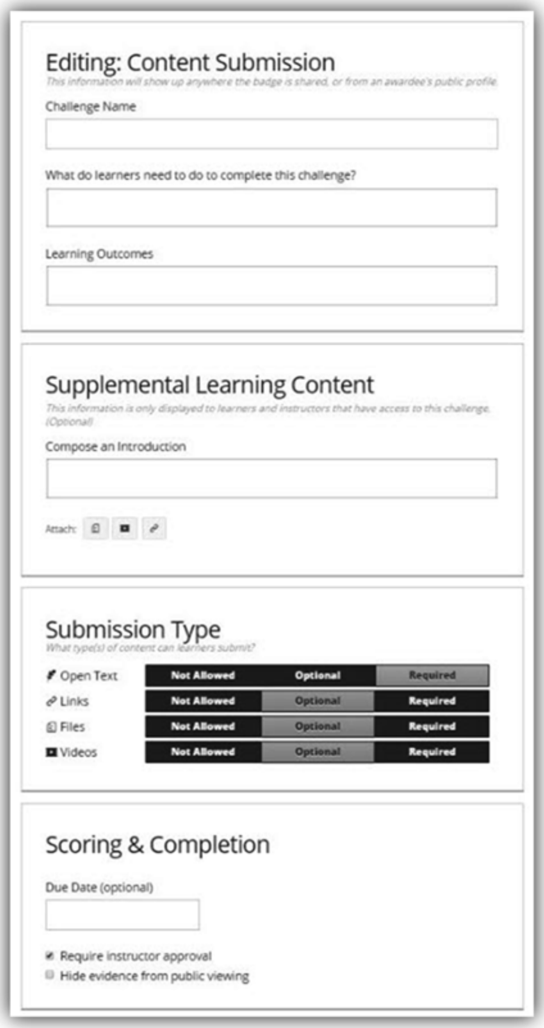

Fig. 10.4 Creating a badge challenge level

Once the challenges have been created, it is possible for the developer to set the requirements for the badge to be awarded. As shown in Fig. 10.5, the criterion for awarding the badge can be based on the completion of all of the challenges or based on a specific minimum score obtained by completing the different challenges.

As a final step in the badge creation process, it is also possible to set prerequisites that need to be completed before the current badge is allowed to be undertaken. In the prerequisite window (see Fig. 10.6), the developer identifies and sets which badges are required to be successfully achieved before the current badge can be earned.

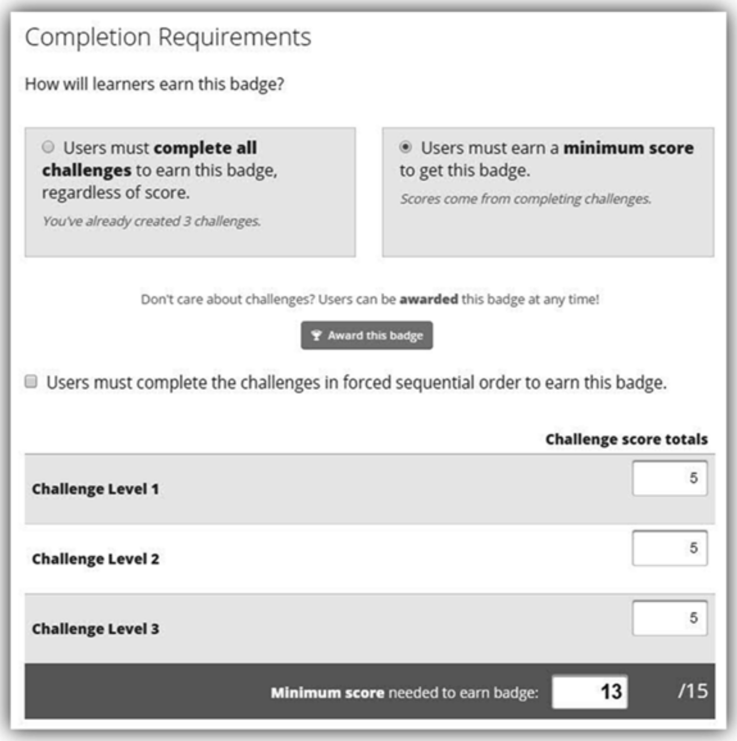

Fig. 10.5 Setting the requirements for obtaining the badge

Once a badge has been created it is placed in the developer's *Passport* badge workshop. Those badges can then be assigned to be completed by specific groups of individuals. Individuals can be invited to join the group by the developer or an individual designated as the group administrator. For example, a class of students could be placed into a group and that group could be assigned a specific number of badges. All members of the group would then be able to access and work on that specific group of badges. Administrators to the group can add individuals to the group, and add and adapt individual badges.

As an individual submits or completes certain challenges, the administrator for that group is notified electronically that a submission has been made. The submission is recorded on the group scorecard (see Fig. 10.7 for an example of the scorecard). The administrator can click on the individual's submission and review it along with a listing of the challenge requirements and the grading rubric. The administrator can then review the submission and provide a score, feedback, and an accept/deny decision about the submission (see Fig. 10.8). If a challenge submission is denied, the administrator may choose to allow the learner to revise and resubmit their work. The feedback provided to the learner may include text, documents,

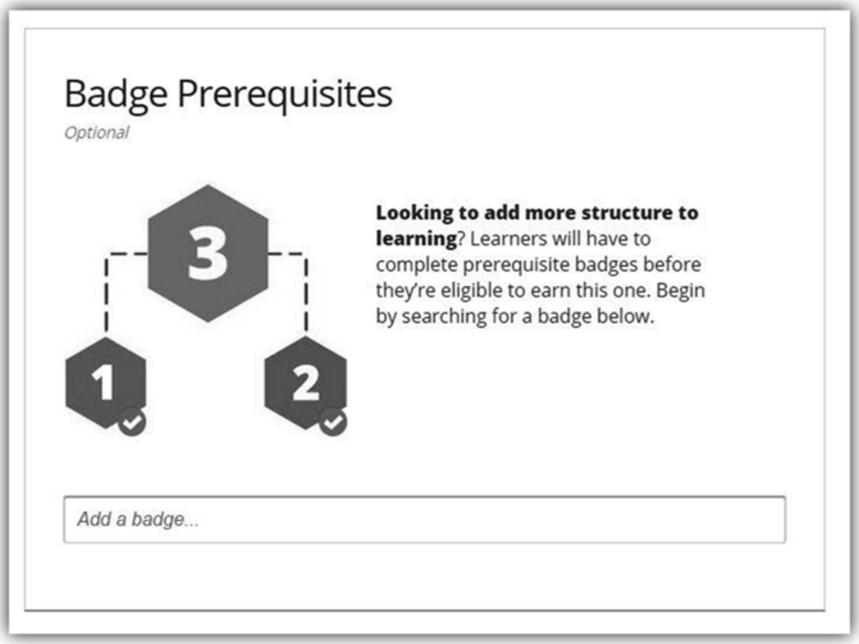

Fig. 10.6 Setting the prerequisite badges that must be completed prior to the current badge

Fig. 10.7 *Passport* submission scorecard viewed by badge administrator revealing what has yet to be submitted, what has been submitted and approved, and what still needs to be reviewed

web links, audio, and video. The decision and the feedback are immediately sent electronically back to the learner.

After all challenges are successfully completed and approved by the administrator, the badge is awarded to the user. The badge may then be posted in the learner's *Passport* Public Profile, at their discretion. The user can choose which badges display on their profile, how they are categorized or grouped together, and whether the badge evidence (what was submitted by the user for the badge's challenges) is displayed or not. The profile can be edited by the user to include a name, picture,

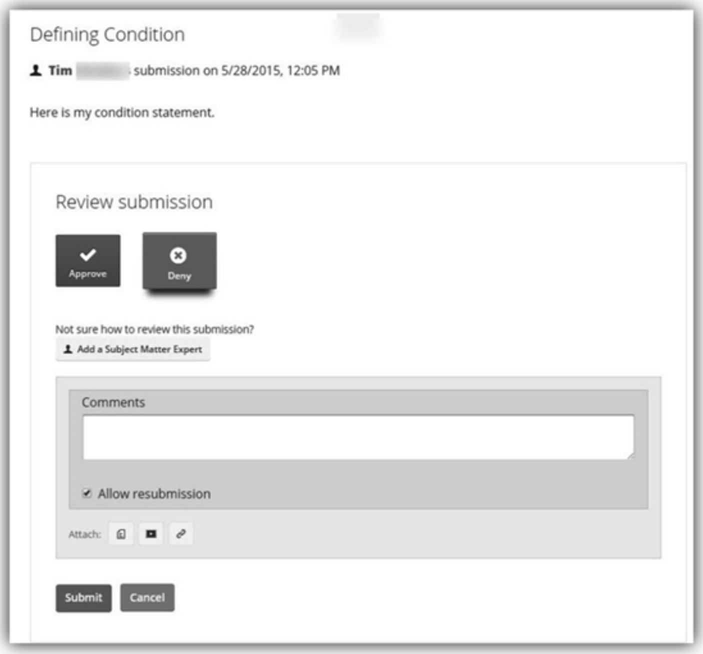

Fig. 10.8 Scoring screen for the badge administrator to accept/deny a learner's challenge submission and provide reinforcing and/or corrective feedback

address, profession, education, experience, and personal summary. The profile can also be linked to social networks such as Facebook, LinkedIn, and Mozilla Backpack. Clicking on any of the posted badges reveals the requirements and what was completed by the learner. Figure 10.9 shows one student's *Passport* Public Profile.

4 Using the *Passport* Platform

In a large "Intro to Educational Technology" course taught within the College of Education at Purdue University, we created multiple badges to help students accomplish the key course competencies. One of those badges is called "Being Digitally Literate in the 21st Century."

In order to develop this badge, we first completed the Digital Badge Worksheet (see Table 10.2).

Badge Issuer: Tim Newby (newby@purdue.edu), course instructor for EDCI 270

Badge Name and Description: "Being Digitally Literate in the 21st Century." This badge requires users to clearly explain and demonstrate what digital literacy entails and how it can be used to acquire needed twenty-first century skills.

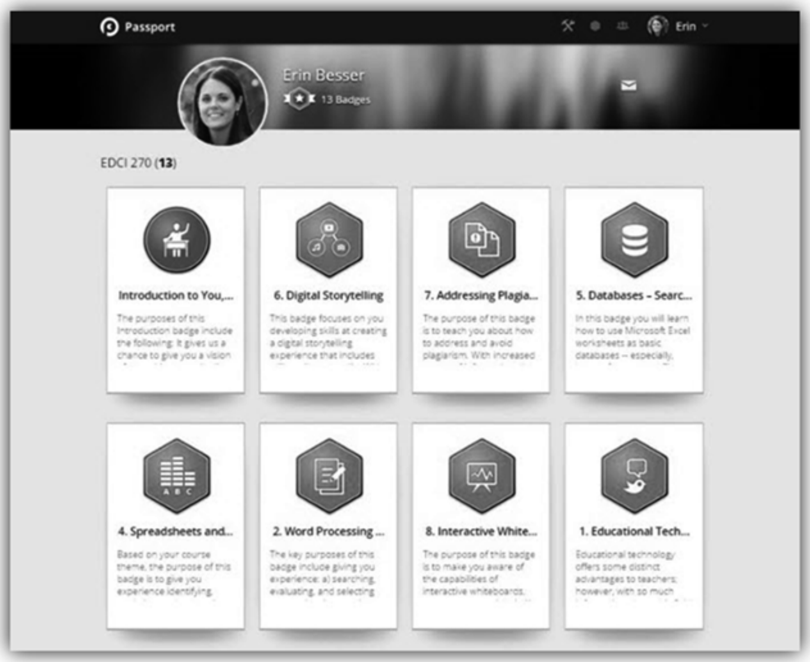

Fig. 10.9 *Passport* Public Profile

Target Audience: EDCI 270 consists of college students who have a desire to enter into teacher education and eventually earn their teaching license. Approximately 70% are female, and 90 % are either in their first or second year of college.

Relevant course outcomes include:

- Describe *digital literacy* and explain each of its key elements.
- Demonstrate how digital literacy impacts the teaching and learning of 21st century skills.

Potential Learning Activities:

- Present a scenario or case that requires the user to research and respond about 21st century skills and how the vision of those skills might be different for those with different levels of digital literacy.
- Have the badge user be able to write out a clear explanation of what the key 21st century skills are and how they will relate to teaching.
- Have the students review how current teachers are modeling digital literacy and the teaching of 21st century skills.
- Engage the user by having them create ways to effectively teach digital literacy and 21st century skills to other teachers.

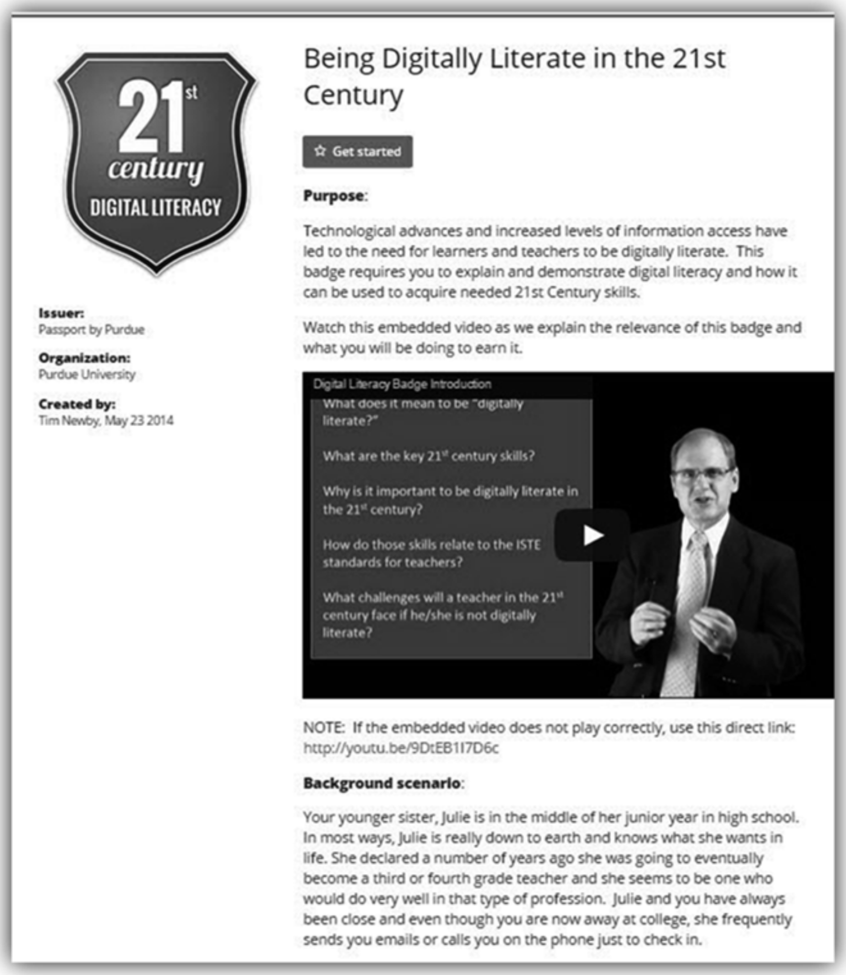

Fig. 10.10 "Being Digitally Literate in the 21st Century" badge introduction

Required Evidence and Assessment Criteria

- Clearly written summary of what it means to be digitally literate—must be well written and clear—no typos. Needs to refer to 21st century skills—what they are and how they are addressed by the digitally literate individual.
- Be able to create a simple outline of what individuals should know and be able to do when declared as "digitally literate." Show it from a teacher, as well as student, point of view.

With a draft of the worksheet completed, we were then able to work within *Passport* to create the badge. Each of the following figures highlights the key ele-

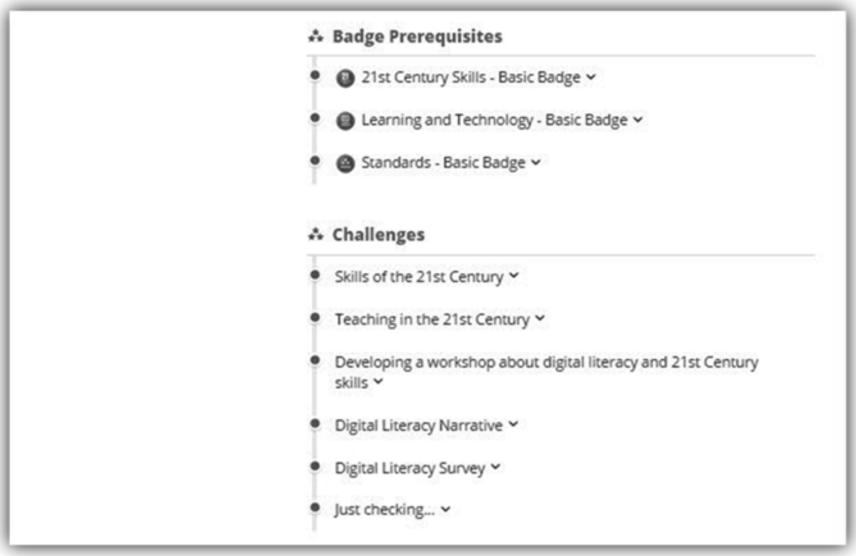

Fig. 10.11 Listing of all badge prerequisites and challenges

ments of the badge and lists many of the design guidelines that were integrated to ensure its success as a learning/instructional experience for the learner.

Figure 10.10 is the introduction to the badge and the first page the learner will see once the badge is accessed. To help orient and motivate the user for what they will be learning, this opening page includes a statement about the overall purpose of the badge, gives a short video where the author walks the learner through the overall objectives for the badge, and presents key questions that will be addressed by completing the badge challenges. Basically, a clear outline is presented so the user is set to know exactly what will be required, what will be practiced, and the value of the skills and knowledge that will be obtained by accomplishing the badge. In addition, a scenario/case is given that sets the stage for the learning activities that will follow.

At the bottom of the opening badge page (see Fig. 10.11), the user is also shown any prerequisite badges that must first be completed before the current badge can be successfully earned. It also lists all of the challenges of the current badge. The listed challenges are links to a list of the requirements for each of those respective challenges. Once the learner is ready to begin the badge, the "Get Started" link (see Fig. 10.10) will take them to the first challenge.

Figure 10.12 shows the first challenge ("Skills of the 21st Century") of the digital literacy badge. Users are given a list of all challenges as well as the badge prerequisites and they can readily navigate to any of those items. An introduction to the challenge is given. In this situation, the scenario discussed on the opening badge page is continued within this challenge. Moreover, an additional link to an outside

Fig. 10.12 Badge challenge including the challenge explanation and task description

video is given as a reference to the user to review prior to completing the given task. Other attached documents, readings, videos, and audio recordings can be included for the user to access and review. This challenge could also have included a set of quiz or survey questions.

Below the introductory scenario statement, the user is given a set of instructions on exactly what must be done in order to successfully complete this challenge. In this case, that is a reflective essay that explains a specific position. In some cases, this may be a list of steps that must be undertaken in order to obtain the needed level of competency with a specific skill. In addition, to enhance the level of user confidence, at this point examples and non-examples of past performances can be presented, and a rubric for how the performance will be assessed will also help to guide the user. The "Complete this challenge!" link can be followed once the user has studied the given material and prepared him/herself to complete the given task.

As shown in Fig. 10.13, to complete the challenge the user is given an open text submission space to insert the required written response for this specific challenge. Different challenges can require the user to upload a document, create a video, supply a link to a specific website, complete a quiz or survey, etc. Also listed on this page are the background information to the challenge and the list of challenge performance requirements and grading rubric. Once completed, the submit button is selected, the submission is locked from further changes, and is sent electronically to the badge administrator for review.

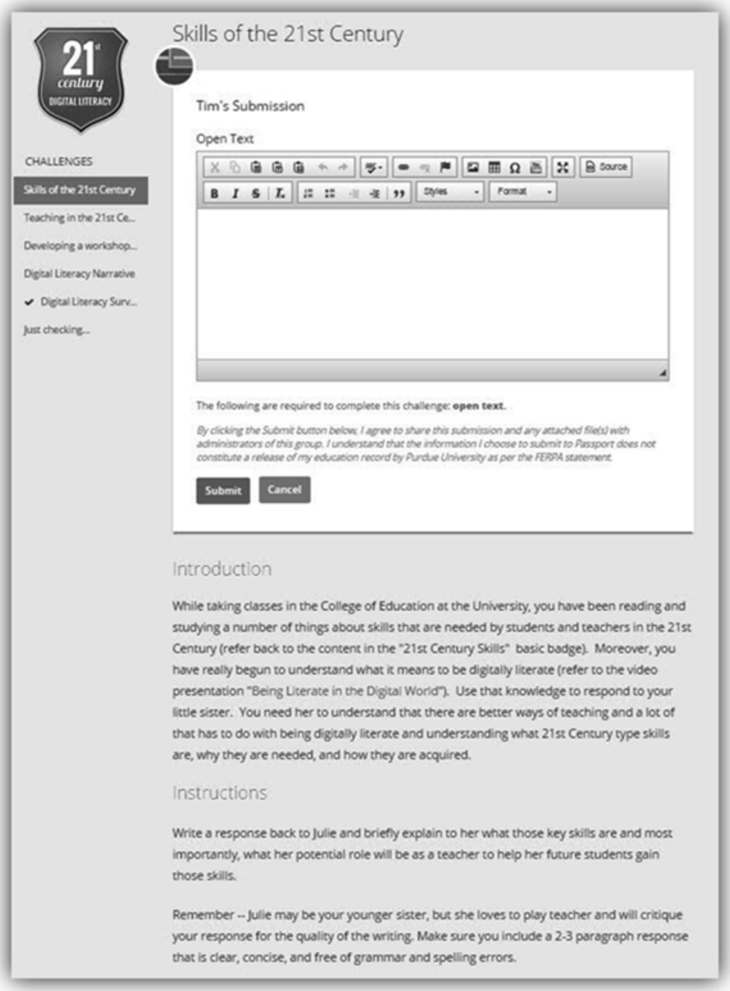

Fig. 10.13 Task submission within the challenge

5 Conclusion

In this chapter we have conveyed important instructional design guidelines—especially the importance of considering motivation, orientation, information, application, and evaluation activities—for designers working in integrated, badge-based learning systems. Badges are being used in more and more powerful ways to motivate and assess users' levels of competency with various skills and knowledge. Even greater potential for instruction is now being investigated by developing ways to use the badges to deliver effective learning experiences to the user. In order to develop learning experiences that are effective, efficient, and appealing, badge platforms must be expanded to include ways to present the information and learning experiences. More importantly, badge developers need to understand the key activities and instructional strategies that must be considered in order to ensure the instructional badge is effective.

The *Passport* badge platform has been developed in a manner to prompt and help the badge designer include many of the needed instructional guidelines. *Passport* offers a distinctive approach, with a close link between designed instructional experiences and digital badge certification. One advantage of *Passport's* integrated approach is the fact that the platform's badge construction process has been scaffolded in such a way as to prompt designers to meet many best-practices instructional design guidelines, including the necessity to start with visible outcomes and objectives, in the form of a "skill" to certify with a discrete "badge" whose name explicitly connects to that skill.

These design guidelines should be considered before, during, and after development and implementation of instructional badges. In order to provide instructional value, the badges should accurately and effectively assess the learners' knowledge and skills that they were to gain by achieving the badge.

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Chapter 11
Transforming Workplace Learning Culture with Digital Badges

Mark Aberdour

Abstract Today's businesses are moving faster than ever in response to constant changes in the world around them. There is increasing acceptance that in order for employees to keep up with constant change and for businesses to stay relevant, learning and development has to move to the heart of the business. Organizations must go through a learning transformation to realize this vision. We need to build a learning culture in the workplace, and this chapter explores how badging programs can help organizations achieve this learning culture.

Existing workplace learning programs combine elements of informal learning, formal training, knowledge sharing and collaboration, social learning, coaching and mentoring, serious games and more. Effective next-generation workplace learning must combine these elements in engaging learning architectures. However, this means breaking out of the traditional learning management system which is still in widespread use. Badging systems can provide the glue that holds these new learning architectures together and can help make the learning process efficient, engaging and effective.

The author draws on 20 years experience working on over 100 learning technology projects for large organizations. As well as putting the case for why badging systems are the ideal vehicle for moving learning to the heart of the business, the chapter looks at how to implement a badging system in the workplace and how to make a success of your badging system through effective rollout strategy and change management, using case studies of digital badges in the workplace.

Keywords Learning transformation • Learning culture • Learning architectures • Badge systems • Workplace learning

M. Aberdour (✉)
LEO Learning Ltd, 52 Old Steine, BRIGHTON, BN1 1NH, United Kingdom
e-mail: mark@theaberdours.co.uk

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1 The Need to Transform Workplace Learning

Today's organizations need to move faster than ever in response to changes in the world around them. In order for organizations to stay agile, resilient and effective, employees must be equipped with relevant and up-to-date skills and knowledge. Yet few organizations are managing to achieve this. While over 90 % of leaders want to respond faster to change, speed up the application of learning at work and boost on-the-job productivity, only 31 % actually think they are doing so (Towards Maturity, 2015). To realize this vision, organizations must undergo a major transformation to move learning and development to the heart of the organization.

One of the ways to build a learning culture in the workplace is through implementing a digital badge program. While many of the more established digital badge programs have occurred in the education sector, we are now seeing them gain more widespread adoption in the workplace learning and development sector too. In this chapter we review some of these early workplace badge program implementations. In doing so, we can already start to see a picture emerging of badges being used to motivate employees to grow their skills and to evidence changing behavior. In the corporate world, decisions are based on data, not on gut feel. However, as few as 15 % of organizations are actively measuring the effectiveness of their learning programs (Towards Maturity, 2015). Improving the collection of evidence could make corporate leaders sit up and take notice of how learning and development has the potential to form the centerpiece of workplace transformation programs.

1.1 Using Badges for Evidencing Change

Measuring the impact of learning programs on staff and organizations requires the collection of evidence over a period of time. Encouragingly, early badge programs appear to be facilitating the submission of evidence by learners regarding the impact of their learning on their own performance. Even in professions such as social care where use of digital technology in the workplace is still new to many front-line workers, we are starting to see employees embrace the idea of voluntarily submitting evidence of the impact of their learning in exchange for a digital badge that recognizes their skill and is portable beyond the boundaries of their current employer's systems (Stewart, 2015).

The dominant model for measuring the success of corporate training programs is to gather simple metrics around attendance and completion, often with no more analysis being done than a basic satisfaction form at the end of the training event. This is the bottom level of the Kirkpatrick model, which has been the primary method for measuring the effectiveness of corporate training for over 30 years (Bates, 2004). In Kirkpatrick's book, Evaluating Training Programs, he describes the four levels of evaluation as follows:

- **Level 1: Reaction**, which measures how well the training was received using simple mechanisms such as satisfaction surveys.

- **Level 2: Learning**, which measures what the trainee has learned as a result of the training, often performed using simple 'before and after' assessments.
- **Level 3: Behavior**, which looks at how trainees applied what they learned and changed their behavior as a result and is assessed weeks or months later, typically using observations or interviews.
- **Level 4: Results**, which looks at bigger picture outcomes such as impact on staff retention, productivity, morale, sales performance, customer satisfaction and other performance-related metrics (Kirkpatrick, 1994).

The 4-level model's popularity draws from providing a systematic and simplified way to understand training evaluation and its close alignment with organizational performance (Bates, 2004). However despite the model's dominance in workplace learning and development, organizations have really struggled to achieve good measurements. When Elearning Guild surveyed over 1500 learning and development professionals, they found that while 84 % tracked course completion and over 50 % tracked reaction and learning, only 20 % measured behavior change and 26 % measured results (Steve Wexler, 2008).

Many of the emerging badge implementations in workplace learning involve the use of reflective writing and evidence submission regarding how the learning has been applied in the workplace following a training event or program in order to gain the badge, which aligns with Level 3 in the Kirkpatrick model. The process of learning, reflecting and evidencing is not widely practiced in workplace learning, however badge programs are starting to show that users are willing to voluntarily perform such tasks in order to gain a digital badge (Stewart, 2015).

1.2 Using Badges within Complex Learning Architectures

Existing workplace learning programs combine elements of formal, structured training courses and more experiential and social learning approaches such as learning through experience (on the job mentoring) and learning through others (knowledge sharing, collaboration and coaching) in a model often referred to as the 70:20:10 framework (Jennings, 2011). Effective next-generation workplace learning must combine all of these elements and channels to create engaging learning architectures.

The traditional system for managing formal workplace learning is called a learning management system (LMS) and many of these systems are now adopting the Open Badges standard. However, these systems are mainly used to manage formal training programs and are rarely strong enough on the social and experiential features to adequately support these types of learning, despite these areas typically forming the bulk of learning in the workplace (Shank, 2012). With no single system at present to manage and facilitate all of these learning approaches, a typical workplace environment utilizes a range of training and recording systems.

This presents a significant challenge in terms of awarding digital badges for different types of learning or building learning paths that encompass multiple systems.

Should organizations connect best of breed systems together or have one system that aims to do everything? This is a key question that is challenging organizations in the early twenty first century.

There has been a move among major learning technology vendors to try build one system that does everything. Recent years have seen vendors like Oracle, IBM, Sumtotal, SAP and others build out wide ranging tool suites encompassing HR and Talent Management, Learning and Development, Social Collaboration and other business functions, usually through the acquisition of other specialist product vendors. These companies have achieved successful growth however it has been noted that they tend to bury specialist learning products in huge, end-to-end suites. An alternative approach supported by many organizations is to procure best of breed software for different business functions. While this results in one organization implementing many different tools from multiple vendors, they will use modern web service architectures to perform single sign on so that users can move quickly and easily between systems, and will share data as needed between systems with one usually serving as a 'single point of truth' regarding employee data.

While many learning management systems now support open badges, the wide range of learning technologies used for supporting many different types of learning mean that that multiple systems must be interrogated in order to successfully utilize badges for engagement, achievement and certification. There are several ways this can be achieved. Firstly, multiple tools could award badges and these are moved into the user's badge backpack. However, this requires lots of tools to adopt the Open Badges standard plus it would be hard to award badges for learning paths incorporating achievements from across many systems.

Alternatively, multiple tools could push data into a single system where badge awards can be managed centrally. This latter model is increasingly viable. In recent years a new specification for describing learner activity and experiences has emerged called Experience API (often shortened to xAPI). xAPI allows statements about learning experiences to be delivered to and stored securely in a Learning Record Store (LRS), and it is in the LRS that badge achievements can be managed and tracked. This ties in well with the original vision of the xAPI Working Group. According to xAPI Specification, "*Authentication services, querying services, visualization services, and personal data services are some examples of additional technologies which the Experience API is designed to support. While the implementation details of these services are not specified here, the Experience API is designed with this larger architectural vision in mind.*" (Experience API Working Group, 2013).

This approach is already being piloted by the UK's largest employer, the National Health Service (NHS). Two regional NHS organizations have run pilots in which an LRS was implemented to collect self-reported experience statements about users' informal learning activity on websites, completion of a formal learning course and submission of reflective statements. At the end of this process, the LRS issued a badge accredited by Health Education England (Price, 2014). As more production-ready LRS products come to market with open badge features, it is likely that we will see these systems increasingly providing a central tool for managing learner data and achievements in complex learning technology environments.

2 Examples of Badge Use for Workplace Learning

There are a number of core areas where digital badge programs are being utilized for workplace learning. These are employee recruitment, internal workforce training, certification and compliance, and continuing professional development. In this section we look at examples of each in turn.

2.1 Badges for Employee Recruitment

One of the obvious advantages of digital badges is that through using the open badges standard, most badge systems now allow their users to export their badges to 'badge backpack' websites and social networks. The big advantage of this is that learners' records are no longer locked into their employers' learning systems and are now portable and can be taken with the learner once they leave their post.

2.1.1 Hull College Group: Employability Skills Seal

The Employability Skills Seal was launched in September 2013 at Hull College Group, which has over 26,000 students in the North East UK. The Employability Skills Seal is an award issued to successful students who have taken part in the college's Progression Passport scheme, a program that aims to demonstrate students' employability and work readiness. The Skills Seal takes the form of Bronze, Silver or Gold digital badges and uses the Mozilla Open Badges framework implemented via the college's virtual learning environment (VLE), based on the open source Moodle platform. A recruitment agency also took part in the project to give the employers' perspective.

Image: Employability Skill Seal

Over 1300 students have been awarded an Employability Skills Seal badge. Given that a key objective of open badges is their portability, uptake in sharing the badges via social media and web pages was actually very low in this case study, despite this being the enabling objective that would allow employers to differentiate the Hull College students from other employment candidates (Armstrong, 2015). According to the project report, key lessons from the project included:

- the need to ensure adequate people resources to gain buy-in from the college and employer community
- using marketing and communications to increase visibility of the project throughout its duration and to students and coaches throughout their courses
- awarding badges automatically based on VLE data, rather than as a manual process requiring a separate data collection process.

Ultimately the team at Hull College Group want employers in their area to be asking to see the Employability Seal as part of their recruitment process, and they will be running the program again in 2014/15 and aiming to apply the lessons learned to drive greater success. The authors take a pragmatic approaching and state, "*We assume however it may well take 3-5 years before we see a majority of students downloading and displaying their badge. Alongside this we intend to consider the benefits of 'internal facing', possibly time-limited badges that would be used mainly within Moodle to recognize smaller scale achievements.*" (Armstrong, 2015).

2.1.2 Badges for Vets

Badges for Vets was co-founded by Bob Sparkman and Eric Burg with funding from the University of California's HASTAC Initiative and the MacArthur Foundation. It is a research project designed to represent veterans' military training in the form of a digital badge in order to translate military skills into a recognizable form that civilian employers can understand and value. It does this by capturing the learning path for a particular award, signaling achievements and building identity and reputation (Jonathan Finkelstein, 2013). Individuals must register their work experience and prior knowledge and are then provided badges which they can add to digital resumes. Using the publicly available website at badgesforvets.org, employers can then use the system to find candidates with relevant skills sets.

Image: Badges for Vets

2.1.3 Newport City Homes

Newport City Homes (NCH) is a housing association in Newport, South Wales. They run a work experience program called The Academy, in which cohorts of 6–8 trainees undertake paid work to gain employability skills. The trainees are awarded badges for induction, essential training in subjects including welfare reform, social housing, fire safety and manual handling. They also gain an alumni badge upon completion of the program (Price, 2015a). Several cohorts have now been through The Academy and the last group were awarded badges. Verbal evidence showed that they saw great value in being awarded open badges, particularly with regards to creating a portfolio to show employers. The trainees export their badges to Mozilla Backpacks when leaving, although NHC are also evaluating the Open Badges Passport and Badger apps as export destinations. Badges are issued using their Moodle-based platform and both administrators and trainees have found this easy to use (Price, 2015b).

NCH are not yet formally measuring the impact of the badge program, this will start with the current group. The success rate of their trainees' gaining employment afterwards is high, with 27 out of 32 trainees having gone on to paid employment including 8 in full time employment at the housing association itself and others going on to employment within the sector locally, with NCH having built a strong reputation for its Academy program.

Image: Newport City Homes

According to Price, some ideas for future of the program include:

- Mapping badges to NVQ competencies
- Badges for event speakers
- Badges for Welsh language classes
- Automatic badge awards using Moodle functionality rather than manual awards.

2.2 *Badges for Internal Workforce Training*

2.2.1 UK National Health Service

As described previously, formal structured learning only represents a small proportion of workplace learning activity, with between 50 and 80 % of workplace learning conducted informally (Shank, 2012). The UK's largest employer, the National

Health Service (NHS) recognizes this and has been running Open Badge pilot programs in two regional NHS organizations. In these pilot studies, users collected experience statements which built towards a badge accredited by Health Education England (HEE). This pilot doubled as a trial for using an xAPI Learning Record Store (LRS) to collect informal and formal learning activity data as well as reflective statements. Users had a bookmarklet tool installed to their browsers so they could report on informal learning experiences on sites such as YouTube. In order to achieve a badge award, users also had to undertake a formal learning course and undertake a piece of reflective practice (Price, 2014).

Outcomes of the pilots were measured using self-assessments of perceived competence and confidence both before and after the learning took place. A key finding was that learners seemed to be motivated by the process of adopting different ways of learning, rather than by the idea of being awarded a badge. It was found that learners actually scored themselves lower in the second self assessment, as the learning and reflection they had undertaken had made them more self-aware about their weaknesses and less confident in their current skills. Using the Mozilla Open Badges standard, users were able to export their HEE-accredited badge from the LRS to their Mozilla backpack.

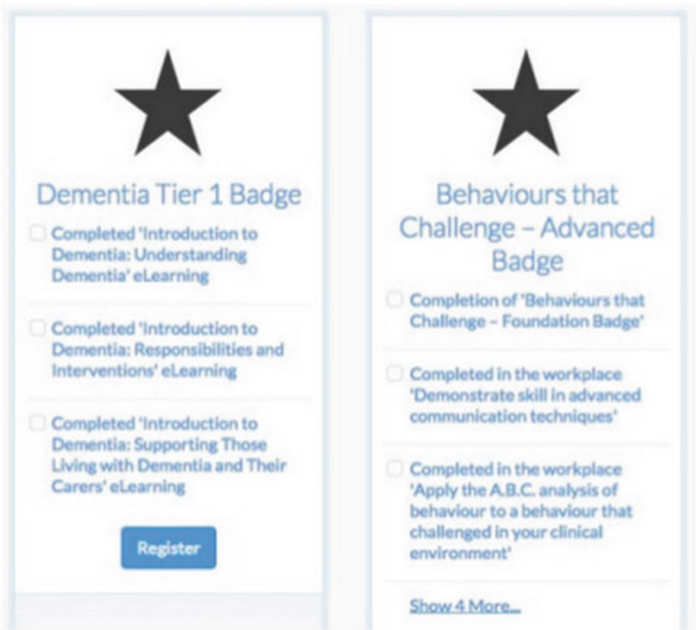

Image: National Health Service

2.3 Badges for Certification and Compliance

2.3.1 Aviva Development Zone by RWA Group

RWA Group supports financial advisors and brokers with regulatory training and compliance. They run online training materials from their platform, Aviva Development Zone, which is based on the Open Badges compliant Moodle learning management system. RWA started out in 2013 with badges for signing up to their training and competence system and have since widened out their badge program to issue a range of criteria-based awards as evidence of assessment and learning as well as for recognition such as a learner of the month award. They encourage users to use their badges during staff appraisals and to highlight their achievements to customers. By April 2015, over 10,000 badges have been issued on the site, highlighting the acceptance and usefulness of digital credentialing in the financial compliance sector (RWA, 2015).

2.3.2 IBM Open Badges Program

As one of the major global IT vendors, IBM training certifications have long been recognized and valued by IT professionals the world over. IBM have a wide range of professional certification programs to validate skills and demonstrate proficiency in IBM technology and solutions as well as a range of training paths to achieve specific skills or certifications.

In 2015 IBM launched a badge program to offer a means of verified proof of achievement, seeing value in the accompanying metadata which states the rigorous process required to achieve a qualification. The badge program has four badge types:

- Explorer badge for the early stages of knowledge and skills acquisition
- Advocate badge for higher levels of proficiency in a specific area of interest
- Certified badge for participants who have achieved formal certification through proctored exams
- Inventor badge for those who can evidence their ability to design and implement complex technology solutions and applications (IBM Open Badge Program, 2015).

Image: IBM

2.4 *Badges for Continuing Professional Development*

Badges are used in professional development for demonstrating achievements and skills, public and progressive digital transcripts, lifelong learning, professional service and competency (Veronica Diaz, 2014). This is clearly a strong area for badge programs and there are more case studies in this sector than any other.

2.4.1 Scottish Social Services Council

The Scottish Social Services Council (SSSC) is a prominent user of digital badges and adopter of the Open Badges standard. This regulatory body aims to raise standards of practice among the social service workforce, registering people who work in the social services sector and regulating their education and training. The sector employs 189,000 staff across Scotland.

At the moment, SSSC badges are typically awarded as part of professional development events, for which separate badges are offered to attendees, contributors, knowledge sharers and those who are able to demonstrate they have applied what they learned. The system relies on self service in that workers have to make an application for a badge via a badge portal and must submit appropriate evidence with this, which encourages the practice of reflective writing in doing so (SSSC Open Badges, 2015).

Image: Scottish Social Services Council

SSSC has experimented with several methods for awarding badges. The most popular to date is to setup a series of three badges for each training event. The Bronze badge may be awarded simply for attendance, an approach used during the pilot phase when a key aim was to introduce the concept of badges and get users to setup a backpack. The Silver badge then requires a short reflective writing exercise, in which users must submit 50–100 words to describe how they plan to apply what they have learned in their workplace. Finally, a Gold badge is awarded when the user submitted some evidence of having applied what they have learned.

The SSSC program began as a pilot in 2014 during which time about 400 badges were issued. By the end of 2015 they are hoping to have awarded 2000 badges nationwide.

The SSSC publishes a website specifically to promote its badge program which contains details of the badges they currently award (http://badges.sssc.uk.com). Advice and guidance is given for how to use and make the most of open badges, and share them using Mozilla Backpack. The pilot site was built in Wordpress using a freely available open badges plug-in. While many of the case studies shown in this chapter have used the open source Moodle learning management system to manage open badge programs, the SSSC opted against Moodle as it does not facilitate the submission of forms as easily as WordPress. However the site has its limitations so they are now planning to have a new badging website developed. Improvements identified during the pilot that would be required in the new site included reissuing badges to changed email addresses (many workers liked the option to collect badges in their inbox rather than sharing to a backpack, sometimes for technical reasons as the Mozilla Backpack was classed as a social network and thus blocked by some employers). Printed transcripts were also an identified requirement (Stewart, 2015).

The badges were very well received by the social services workforce across Scotland. Despite operating in a sector where use of digital technology in the workplace is still new to many front-line workers, it was found that employees were very keen on badges as they offered recognition of achievement and skills that was lacking in their profession. In addition, it was found that social workers are generally good at keeping continuing professional development (CPD) records but these were usually on the employer's computer systems and not transferrable. Of course, open badges offers a transferrable mechanism to move badges into a central personal storage space such as Mozilla Backpack, but only 2–3 % of SSSC badge recipients are sharing badges online, therefore a key aim of SSSC moving forwards is to gain employer buy-in to the badging system which should enable social workers to see the value in sharing the badges into a public backpack, for example (Stewart, 2015).

The SSSC badging program is one of the most mature programs in workplace badging at this time, so it's interesting to reflect on their findings and roadmap. According to Stewart, this includes:

- Widening the social care badging system into individual employers, who will need to enable employees to access some of the social networks that drive badging systems, such as Credly and Mozilla Backpack.

- Scaling up the program with a new badging submission website
- Good tracking and analytics tools need to be in place for measuring badge shares and views.

Interestingly, the badges gained by SSSC's own staff will help to get the SSSC themselves accredited by the Scottish Government. The Carers' Kitemark program is a key Scottish Government policy aiming to help Scotland's estimated 660,000 carers and employers to sign up and demonstrate their commitment to supporting employees who provide care and support for elderly or disabled relatives. The Carers' Kitemark badges are awarded for Carer Aware session attendees and all SSSC staff are awarded the badge for attending these sessions and providing reflections. The evidence gathered from these reflections will help SSSC get their own Carer Positive Employer accreditation from the Scottish Government.

According to Stewart, the social service workforce is already focused on maintaining annual CPD records so reflective writing is not a huge step for this audience, however the key selling point of badges to the audience is that badges help to measure impact of learning as staff develop in their careers and are portable so can be taken from one employer to another (Stewart, 2015).

This is the first case study that has invested in its own website to support the badge program, using a subdomain of the main SSSC website: http://badges.sssc.uk.com. It is important to choose a long-term domain name for this as people will click on evidence links in badges that don't expire for years to come, so using a subdomain makes perfect sense. This was not the only marketing activity though and significant offline marketing was undertaken at events, where the instructor is able to direct people to one place to get information about what to do with their badge, and followed up with links to the same location in subsequent emails that go out to all attendees following the event. Stewart emphasizes the need to keep on signposting people to the website in order to get started, and the tech support team were also told to signpost people to the site for self service support.

Brand is also very important to the SSSC, and the communications team worked with their workforce development colleagues on making sure that the badges were developed in line with a brand that the sector already recognizes and trusts, giving the badges authority and value for the recipient. This helps to raise awareness across the sector among badge viewers both of Open Badges and of the SSSC as the organization leading on workforce development in Scotland. One event also included a Social Reporter badge and it turned into the most covered event of all they had done to date.

2.4.2 Case Study: HIMATS

Highland and Moray Accredited Training Services (HiMATS) offer accredited qualifications. They regularly work in partnership with the Care and Learning Alliance (CALA) in North Scotland, a membership organization for professionals in child care. CALA delivers short training events such as In-service and CPD training and worked in conjunction with HiMATS to look at how the retention and application of learning could be improved. They followed the SSSC model described above and on their short courses, participants are awarded a Bronze badge for attendance, Silver for answering an assessment based on course content and handouts with a 75 % pass, and a Gold badge for writing a reflective statement on what they learned on the course and how they will apply it to practice. This is all done using Moodle, including the reflective writing submission which uses Moodle's assignment activity and which is sense checked manually by an expert before the badge is released (Tucker, 2015).

2.4.3 Case Study: EDUCAUSE

EDUCAUSE is a professional membership organization that supports the transformative role that information technology can play in higher education. Its membership comprises 1800 institutions and 300 corporations serving Higher Education IT.

Image: EDUCAUSE

EDUCAUSE implemented a badging program in 2014 to reward individuals for engagement with the organization. The program awards badges for Community Service (12 badges for serving the community), Communications (4 badges for event presenting), Leadership Development (6 badges for completing intensive learning programs), Awards (3 badges for formal EDUCAUSE awards program recipients) and Subject Matter (4 badges for engagement and participation in learning programs). They do not use Open Badges, however their badges can be displayed via Credly and shared to social networks (EDUCAUSE Badging Program, 2015).

As at August 2014, EDUCAUSE have awarded 39 badges over 2500 times. Credly allows organizations to track 'badge activity' which includes the numbers of times badges are viewed, clicked or shared, and the EDUCASE badges received nearly 180,000 impressions, with 80 % of activity coming from badges shared on LinkedIn (Veronica Diaz, 2014).

2.4.4 Case Study: Teacher Learning Journeys

The Teacher Learning Journeys (TLJ) badging system was designed by three partners: Penn State University (design, implementation, content and instructional pedagogy), National Aeronautics and Space Administration (data and content that could be integrated into teachers' daily practices) and National Science Teachers Association (certification, regulatory and standards).

Image: Teacher Learning Journeys

TLJ offered online professional development for science teachers via a website that allowed teachers to set their professional development goals, select learning activities that aligned with those goals and awarded badges for completion of reflective activities. Paid mentors assessed the reflective activity logs and awarded stamps for completions with short reflection and badges where a teacher had written a plan for incorporating the new skill into their work. The research project is now over so the paid mentors have ceased working, however the popularity of the site has seen professional volunteers now perform this task.

Badge metadata included a description of the tasks required by each professional development activity, the evidence of the learner's mastery, and feedback provided by the expert practitioner. In their research study of the TLJ data, Gamrat et al found that teachers customized their professional development around their workplace goals. They tended to opt for stamps rather than badges, reflecting a satisfaction with a lower level of achievement in order to gain the expertise needed for their workplace. The ability for teachers to adapt their professional development to their own goals led to them being more confident in applying those new skills in the workplace (Christopher Gamrat, 2014).

3 How to Implement a Badging System in the Workplace

In their 2014 survey of 1900 organizations, Extreme Networks recommended a number of key steps for implementing a badging system (Afshar, 2014). We have used these steps as headings in this section, and outlined some of the key lessons learned from the above workplace learning case studies under each heading.

3.1 Make Sure Your IT Infrastructure Is Rock Solid

The badge systems used are discussed on the next page, but before you even get to selecting Moodle, WordPress or some other badge platform, you do need a solid IT infrastructure. Your employees will need to be able to get online, they may need access to email if you are awarding badges over email and they will need good connectivity. Several case studies suggested users actually use personal email addresses in their badge systems to help ensure portability of badges. This can all raise problems in some sectors, especially where workers are not desk or computer based.

3.2 Appoint a Badge Leader

The case studies reviewed are early adopters and tended to have visionary leaders who were naturally excited about the potential of open badges. As badge programs become more widespread, they will need to be managed by workplace learning and development practitioners. These practitioners will still need to take on a leadership role, and one of the key challenges outlined has been around strong internal marketing and good change management. A badge system implementation will require a strong leader within the organization to champion the program.

3.3 Set the Badges: Topics and Requirements

Learning designers will need to understand the different situations that badges can be used in, from motivation and reward through to certification and recognition. Each has its place and to achieve the right mix, the learning designers will need to develop this new skill.

3.4 Choose a Badge Infrastructure

Most of the case studies reviewed in this chapter used the open source Moodle platform to manage their badge programs. Moodle is a popular, mature and scalable learning management system and was one of the first LMS products to support the open badges standard using funding from the MacArthur Foundation. In Moodle, a badge can be awarded for completing either a single course or a curriculum of courses, or for completion of individual activities or tasks within a course. WordPress is another system used in our case studies, which is also open source and has an open badge plug-in available.

3.5 Plan How Each Achievement Will Be Publicized

Marketing came up as a regular issue during the case studies examined, especially the topic of sharing badges via social networks or to external backpacks. This is where the real value of open badges lies, but users needed some help to realize this. If a badge is for hiring purposes, it is important to export it to AboutMe or LinkedIn and your users may need help in doing so.

3.6 Run a Small Scale Pilot

All of our case studies started small and then rolled out more widely. Badge programs require a learning curve on the part of learning and development teams, HR teams, marketing teams and so on. Each case study chose a particular cohort of users to start with and grew the program from there.

3.7 Roll Out the Program

This is where the program really takes hold but this is also where it can get very difficult. Rolling out new systems is never easy. If badges are simply an extension or plug-in to an existing platform you use, such as Moodle, then great. In that case your task is one of marketing and PR, training and support. But if you need a new platform to manage badges then that obviously comes with its own risks and implementation challenges to overcome. The program will need careful planning, strong project management, good leadership and buy-in from management.

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Chapter 12
The Role of Endorsement in Open Badges Ecosystems

Deborah Everhart, Anne Derryberry, Erin Knight, and Sunny Lee

Abstract In order for badges to gain acceptance, structures must be in place to ensure transparency and confidence in the badging process, as well as trust amongst badge earners, issuers, and consumers. Badges enable new learning ecosystems, necessitating new methodologies for validation of learning providers, assessors, and learning outcomes. Endorsement provides conceptual and technical infrastructure for third-parties to publicly acknowledge the value of badges. The endorsement specification, part of the Open Badges Standard, enables endorsement of any of the badge objects, i.e. Badge Class, Issuer, or Assertion. Endorsement encourages the development of trust networks and connections among stakeholders in communities such as education, government, standards bodies, employers, and industry associations. It helps badge earners understand which badges carry the most value for their goals. Badge issuers benefit from external validation of their badges. Educators, employers, and other consumers who evaluate learners' achievements can better determine which badges are most appropriate in their contexts. Badge endorsers make their values known by analyzing the quality of specific badges, including how the badge is defined, the competencies it represents, its standards alignments, the process of assessing badge earners, and the qualifications of the badge issuer to structure and evaluate the learning achievement represented by the badge. Endorsement enables validation in open badge ecosystems, furthering badge opportunities.

Keywords Endorsement • Validation • Analytics • Infrastructure • Standards • Trust networks

D. Everhart (✉)
Georgetown University, Washington, DC, USA
e-mail: Deborah.Everhart@georgetown.edu

A. Derryberry • E. Knight • S. Lee
Badge Labs, Cape Elizabeth, ME, USA

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1 Introduction

The digital age has created unprecedented opportunities to learn, whether in traditional formal environments or non-traditional, informal environments. In order to reach personal, academic, and career goals, learners both want and need to aggregate learning achievements and associated evidence of learning from multiple sources in portable, digital, interoperable, and verifiable ways. The dynamic technology of Open Badges can make that happen. Open Badges enable the representation, verification, and sharing of skills and knowledge acquired in a classroom, on the job, in the community, or in any learning environment.

In order for badges to gain acceptance, structures must be in place to ensure transparency and confidence in the badging process. Technically, this includes authenticating that a badge earner is the one who earned the badge and that badges are verified as coming from an authorized source. Further, the value of a badge must be established by validating that the skills and learning outcomes are consistently measurable and repeatable. Learning providers have traditionally relied on academic accreditation and reputation as validation of their learning outcomes and credentials (Derryberry, 2013). Open badges enable new learning ecosystems, necessitating new methodologies for validation of learning providers, assessors, and learning outcomes through the recent introduction of endorsement (Derryberry, Everhart, & Knight, 2013). But how does the endorsement function for open badges convey a badge's value?

Endorsement encourages the development of trust networks and connections among stakeholders in communities such as education, government, standards bodies, employers, and industry associations. Badge endorsers make their values known by analyzing the quality of specific badges, including how the badge is defined, the competencies it represents, its standards alignments, the process of assessing badge earners, and the qualifications of the badge issuer to structure and evaluate the learning achievement represented by the badge. With endorsement, badge earners are better able to understand which badges carry the most value for their goals. Badge issuers benefit from external validation of their badges. Educators, employers, and other consumers who evaluate learners' achievements can better determine which badges are most appropriate in their contexts.

As of this writing, badge endorsement is new and has been implemented only in prototypes. Therefore, the purpose of this chapter is not to study current endorsement practices, but rather to provide a definition of endorsement and how it is intended to enable validation in open badge ecosystems, advancing future badge opportunities. For a foundational guide to scholarly work on badges that has informed the thinking about endorsement and validation of open badges, see *Digital Badges: An Annotated Research Bibliography* (Grant & Shawgo, 2013).

2 Why Is Badge Endorsement Important?

As the level of interest in and use of open badges increases, so does the knowledge required to understand the range of available badges and their value in various contexts. Information in the form of badge endorsement supports a variety of stakeholders in determining which badges best meet their needs. It also encourages the development of trust networks, allowing for many different organizations and individuals to connect together in new and emergent ways.

When the concept of endorsement initially surfaced, a number of questions drove exploration and discussion. From the outset, the badge community recognized that badge consumers would not necessarily accept a badge's value or validity merely on the say-so of the issuer. Third-party endorsement has long been considered an essential mechanism for establishing a badge's value in a particular context (Knight, 2013; Mozilla, 2012), because it is through third-party endorsement that a badge gains currency and value within the ecosystem in which it resides (Grant, 2014).

Third-party endorsement is critical to building trust networks between badge issuers, badge earners, and badge consumers (see S. Grant's Chap. 6 in this volume). A badge issuer, for example, might not be widely known within a given industry, and might, therefore, have relatively little uptake for its badges despite the strength of their design; a well-known endorser—such as an industry association or major employer—can bring attention to those badges that otherwise would languish unnoticed. Conversely, badges from different issuers might exist within the same ecosystem, with each issuer intending to document equivalent learning accomplishments and competencies of badge seekers; third-party endorsements can help badge seekers identify which badges and badge issuers are most trusted by consumers.

In one possible example of what happens without endorsement, Luis receives a badge demonstrating his proficiency in interviewing as part of a high school class in which he interviewed other students on their reactions to gun violence in America. The badge is recognized as part of his class requirements, and it provides him with portable evidence of learning that he can display on social media, profiles, and/or portfolios of his work. But without third-party endorsements recognizing the value of the badge, anyone who sees it would need to ascertain how and why the badge is relevant and represents valid learning achievements that are useful in contexts outside the high school class. A youth organization at the school or an employer looking for someone with good communication skills could glean useful information from the badge, but they would need to do so on a case-by-case basis for each individual badge issued, unless they had a broader framework for defining the badge's value. Laborious, unclear, and/or unfounded determinations of how badges are valuable in different contexts hinders the expansion of badge ecosystems.

Endorsements can help address these problems inherent in the "one-off" nature of determining badge value by creating trust networks through rich linked information. The valuable information included in endorsements can include: well-defined criteria such as alignment with standards, uses for the badge in the context of the endorsing organization, descriptions of evidence of learning, assessment techniques, organization values, etc. The types of rich information and the benefits of endorsement will continue to grow over time (Badge Alliance, 2014a).

3 Who Benefits from Badge Endorsement?

Endorsement allows external organizations to publicly indicate which badges are aligned with their values—those that are the most meaningful and useful to them. Consequently, each of these stakeholders benefits from badge endorsement and its related trust network effects.

- **Badge earners**, the individuals whose learning achievements are represented by badges, can more fully grasp which badges carry the most credential value appropriate for achieving their goals. Endorsement can also help learners understand how they might further leverage the value of the badges they earn.
- **Badge issuers**, the learning experience providers who define, create, and assess learning achievements and competencies through the badges they issue, can benefit from external validation of their badges.
- **Badge viewers**, the educators, employers, and other consumers who use badges to understand and evaluate learners' achievements, can better determine which badges are most appropriate for them within their specific contexts.
- **Badge endorsers**, the organizations who examine and acknowledge the value inherent in badges, can clearly recognize and publicly acknowledge their values through badge endorsement, and indicate their conceptual alignment with external organizations.

4 How Does Badge Endorsement Work?

Open badges are digital representations of skills and achievements, and the digital nature of badges enables each badge to carry with it the information needed to understand the learning it represents. This requires a technological infrastructure to support badging use cases. The Open Badges Standard defines the technological specifications that ensure that badges are interoperable and convey information uniformly from one context to another.

Badge endorsement provides a conceptual and technical infrastructure for third parties to publicly acknowledge the value of a badge, a badge issuer, or the issuance of a badge to a specific earner. Endorsement is part of the extensions specification of the Open Badges Standard, enabling endorsement of any of the badge objects that comprise an open badge: Badge Class, Badge Issuer, and/or Badge Assertion (see

Sect. 4.1 below). Badge metadata can include endorsement in badges issued to earners. Endorsement accommodates display, discovery, and analytics, broadening the ways in which badges are used.

As of this writing, the endorsement extensions are new and have been implemented only in prototypes. But a variety of endorsement use cases supported by the technical extensions can start to build a framework for trust networks within the open badges ecosystem. In addition, organic protocols and practices are likely to evolve around how endorsements are given out—both solicited and unsolicited.

In one possible example with endorsement, Luis builds on what he learned in his high school class, and he goes on to receive a badge demonstrating his proficiency in interviewing and segment hosting from Youth Radio after producing a piece on student reactions to gun violence in America. After his story goes out, it's aired by National Public Radio and heard by a broad variety of audiences who value its content. There are different levels of endorsement that are possible for this badge defined and issued by Youth Radio (the badge class), Youth Radio (the issuer), and the specific badge that Luis received (the badge assertion).

- A local public radio company like WNYC can endorse the Youth Radio "Interviewing and Segment Hosting" badge (badge class), acknowledging the quality of the learning that takes place in order to earn the badge. The endorsement information includes WNYC's evaluation of the value of activities and evidence of learning required to earn the badge.
- The Des Moines Register can endorse the Youth Radio "Interviewing and Segment Hosting" badge (badge class) as one of many badges they recognize as "recommendations" for potential employees applying to their multimedia division. The endorsement information includes the Register's mapping of job skill descriptions to the criteria of the badge.
- USC Annenberg School of Journalism can endorse Youth Radio (the issuer) for its quality content and learning programs for youth as represented in this badge. The endorsement information includes alignment of the badge to core competencies in journalism.
- National Public Radio can endorse the specific badge Luis has received tied to the story on gun violence in America (the badge assertion), recognizing his great work on the story. The endorsement information includes a description of how Luis's story demonstrates their excellence in media criteria.

But it's not just organizations that could confer endorsements. Similar to WNYC, the Des Moines Register, USC Annenberg School of Journalism, or National Public Radio, individual listeners who appreciated the story can also endorse Luis's badge assertion, Youth Radio's programs, and/or the Interviewing and Segment Hosting badge.

When Luis displays his badge on social media, profiles, and/or portfolios of his work, the endorsement details from other organizations or individuals will be viewable for others to see because they are linked to the badge in the badge metadata. How endorsement works at a technical level is detailed below.

4.1 Key Terms and Concepts

Defining endorsement and how it is technically implemented are expanded upon throughout this chapter. In order to understand endorsement, it is useful to clarify several related concepts.

Authentication certifies that credentials (including alternative credentials such as badges) issued by an institution or organization have undergone a defined process to ensure the credential bearer has met the standards required by the organization. In technical terms, authentication also refers to a login or other mechanism to determine that a user matches the identity of a user record in a given system (Everhart, Sandeen, Seymour, & Yoshino, 2014).

Authorization signifies that an institution or organization has met standards permitting them to issue credentials. Authorization could be granted by an educational accrediting agency, a government agency, an industry standards organization, a licensing board, or other "authority" in a specific arena.

Endorsement is a third-party acknowledgment of the value of a component in an ecosystem. In an open badges ecosystem, endorsements contribute to validation through endorsers publicly stating why and in what context specific badges and badge issuers have credibility, reliability, and relevance.

Validation refers to the ways stakeholders in an ecosystem determine the value of components in that ecosystem. In an open badges ecosystem, stakeholders validate the value of badges and badge issuers through evaluation of their credibility, reliability, and relevance to their needs (Casilli, 2012).

Verification is the ability to technically confirm who granted specific credentials or badges, including when and in what context. Badge verification as defined in the Open Badges Standard provides confirmation that a specific badge was awarded by a specific issuer to a specific person. Verification plays a role in validation in that verified learning achievements generally have more value than self-asserted achievements.

4.2 Open Badges Standard

The most important technological innovation and requirement for badges is the Open Badges Standard, which defines the information model for badges to enable interoperability. The Open Badges Standard describes a method for packaging information about skills acquisition and accomplishments and embedding it into a file as a digital badge (Badge Alliance, 2014b). The purpose of this standard is to enable interoperability, verifiability, and portability of digitized credentials. When badges use this standard specification, they can be "read" across any systems using the standard and therefore can be used by people for multiple purposes across various organizations.

Version 1.1 of the Open Badges Standard was released in May 2015 (Badge Alliance, 2015) as a collaboration of the W3C Credential Community Group (W3C, 2015), the Open Badges Standard working group (Badge Alliance, 2014b), and the larger open badges community (Open Badges Community, 2014), thus making it a truly community-driven effort. See the specification site (Badge Alliance, 2015) for more details on the standard.

The Open Badges Standard is comprised of three core data objects (known as Badge Objects): Assertion, Badge Class, and Issuer. The badge class outlines the general definition of a badge, including information about the learning or skill the badge represents; the issuer object includes information about the issuing organization; and the badge assertion specifies the details of the particular instance of a badge class issued to a specific recipient. A correctly constructed open badge includes all three of these badge objects embedded within it. Each of the badge objects is a collection of properties and values, some of which are required and others that are optional.

The Open Badges Standard specifies the information fields for each type of badge object, but it is the responsibility of the issuing organization to define the specific details of each field. This gives the issuing organization the flexibility to build badges that are aligned with their offerings and programs, while still ensuring there is a consistent informational model across badges from different organizations.

The Open Badges Standard enables and ensures:

- **Interoperability**: When badge systems are based on an open standard and the information fields are consistent across badges from different organizations, all open badges are interoperable. This means that technology systems, tools, and platforms can be built to recognize and use badges without the need to develop proprietary methodologies. Most importantly, it ensures that earners can collect and combine multiple badges across contexts and across their lifetimes, thus building a comprehensive portfolio of their skills and experiences.
- **Verification**: Each badge includes information about the issuing organization and the recipient. This allows for technical verification of the badge, ensuring that the issuing organization in fact issued this particular badge to this recipient, making it difficult to game the system or claim fake badges.
- **Portability**: A consistent information model allows for easy transfer of badges across systems, including across social media sites, blogs, job sites, and more.
- **Common Usage**: Issuing organizations define the specific information that is included in the badge, but the use of standard required fields assures that each badge carries the foundational information needed to understand and vet that badge. Consequently, when an earner shares the badge with a potential employer or admissions officer, the badge consumer has the basic information needed to understand the badge and the learning it represents in order to evaluate the badge and earner.

4.3 Open Badge Components

A **Badge Assertion** is a JSON (JavaScript Object Notation)-structured representation of the data for a specific badge that has been awarded to a single earner (a more detailed technical discussion follows in the next section). The assertion for a badge includes data required by the Open Badges Standard specification. An assertion can be stored in a hosted file or a JSON Web signature, and it includes the following information fields:

- id—unique internationalized resource identifier (IRI) for the badge
- @context—a valid JSON-LD context array or object
- type—a valid JSON-LD representation of the Assertion type
- recipient—information about the badge earner
- badge URL—uniform resource locator (URL) that points to the type of badge being awarded, i.e. BadgeClass object
- VerificationObject—information that allows the badge consumer to authenticate the Assertion information
- issuedOn—date the badge was awarded
- image URL—URL of the badge visual design (optional)
- evidence URL—URL of the work the recipient did to earn the badge (optional)
- expires—expiration date of the badge, if applicable (optional)
- endorsement (optional)

A **Badge Class** is a definition of an earnable badge, which may be awarded to one or more earners. When a badge issuer creates and issues a badge, the badge class is created automatically. The badge awarded to the earner is represented as an assertion, which links to the badge class. The badge class in turn includes a link to the issuer organization JSON for the badge. This means the data for an awarded badge include information about the earner, the badge itself, and whoever issued it. The BadgeClass includes the following information fields:

- id—unique internationalized resource identifier (IRI) for the BadgeClass
- @context—a valid JSON-LD context array or object
- type—a valid JSON-LD representation of the BadgeClass type
- name—Badge Name
- description—short description of what the badge represents
- image URL—URL of the badge visual design
- criteria—URL of the criteria for earning the badge
- issuer—URL of organization that issued the badge, i.e. Issuer object
- alignment—list of URLs associated with standards the badge aligns with (optional)
- tags—list of tags that describe the learning content of the badge (optional)
- endorsement (optional)

A **Badge Issuer** is a person or organization who creates/offers badges and issues them to earners, and it includes the following information fields:

- id—unique internationalized resource identifier (IRI) for the hosted IssuerOrganization
- @context—a valid JSON-LD context array or object
- type—a valid JSON-LD representation of the Issuer type
- name—name of the issuing organization
- url—URL of the organization
- description—description of the organization
- image—an image representing the organization (optional)
- email—contact information for someone at the organization (optional)
- endorsement (optional)

4.4 JSON-LD and Open Badge Extensions

Version 1.1 of the Open Badges Standard included important changes: the introduction of JSON-LD technology and the capacity to add formal extensions to the standard. The specification was adapted to use Linked Data/JSON-LD (JSON-LD, 2011) technology, which is increasingly being adopted by technology companies (Schema.org, 2013). According to the JSON site, "Linked Data empowers people that publish and use information on the Web. It is a way to create a network of standards-based, machine-readable data across Web sites" (JSON-LD, 2011). "JSON-LD is a lightweight Linked Data format. It is easy for humans to read and write. It is based on the already successful JSON (JavaScript Object Notation) format and provides a way to help JSON data interoperate at Web-scale" (JSON-LD, 2011).

This version of the Open Badges Standard was designed to be fully backwards compatible with version 1.0. Therefore, whether badges are defined using version 1.1 or version 1.0, they will still be interoperable and have the same features and affordances mentioned above.

By adding three new JSON-LD properties to open badges—@context, id, and type—they become fully understandable Linked Data. In particular, JSON-LD technology for open badges provides key benefits:

- All version 1.1 Open Badges can be indexed and understood better by search engines and directories.
- Stakeholders in the open badges ecosystem, such as issuers, earners, and badge consumers, benefit from well-understood, human readable, well-defined, and context-driven metadata.

The biggest feature introduction for version 1.1 was the extension specification. As mentioned above, open badges metadata fields were already clearly defined, and there has long been the ability to add additional data to badges. However, the ability to add data by learning providers was not formalized in any way and was widely ignored across the ecosystem. Increasingly organizations had been requesting the ability to add additional fields to satisfy the particular needs of their communities in a way that could be understood across different issuers and consumers. The extension specification was the solution to these needs and requests.

The extension specification allows issuers to add more metadata to badges in a way that the data is machine-readable and easily parsed by badge consumers. Extensions can be added to any of the three badge object types: Assertion, Badge Class, and/or Issuer. This allows badge issuers to develop extensions in an open and standardized way. For example, if badge issuer A develops a geo-location extension that includes address information and latitudinal and longitudinal data for where learning experiences take place, issuer B and C can use that same extension to fulfill the same needs representing geo-location data.

This has significant advantages:

- The open badges foundational metadata itself is kept simple and lean.
- Community members can experiment with additional fields through the extensions. If there is a particular extension being used by a growing number of organizations, as in the above geo-location extension example, a discussion may be started on whether that field should be brought into the foundational specification.
- Different extensions can meet the needs of different communities.

4.5 Endorsement in the Open Badges Standard

Endorsement in the Open Badges Standard provides technical infrastructure for endorsers to recognize and publicly acknowledge the value of a badge, a badge issuer, and/or a specific badge assertion. Endorsement adds a new metadata component to the Open Badges Standard by taking advantage of the extension specification and JSON-LD properties that are key components of the version 1.1 release.

For example, the endorsement extension lets a third-party (or non-affiliated) organization endorse a badge class (the generic version of the badge, without earner attribution) that an issuer offers. Through linked data references, the endorsement can be connected to the badge class. Consequently, when that badge issuer awards that endorsed badge class to earners (individual, earner-attributed badges), the endorsement is also connected to those earned badges through the badge metadata.

Endorsement of a specific badge class does not extend endorsement to all badge classes offered by an issuer—it applies only to the badge class that is endorsed and is thus tied to any instances (i.e., Assertions) of that badge issued to earners. However, endorsement of an issuer can connect the endorsement to the Issuer object through linked data references, which in turn connects to all badges issued by that issuer. Linked data provides a common technical method of connecting data from different sources so that these connections can be understood and read by different types of computer systems. It is similar to the way Web technologies link and serve web pages, but applied to structured data and metadata (data that describes other data). Therefore, endorsements using linked data contribute to the interoperability of badge systems that support validity processes and encourage the development of badges that are recognized as valuable by stakeholders in the ecosystem.

Technically, endorsement accommodates the following features, among others (Badge Alliance, 2014a):

- endorsement of existing badges, i.e., those that have already been issued
- endorsement of new badges, in collaboration with the badge creator
- expiration or revocation of an endorsement by the originating endorser
- acceptance or rejection of endorsements by a badge issuer
- display of endorsements by a badge issuer
- display of endorsements by an endorser
- display of a badge that a learner has earned (a badge instance) that references the badge's endorsements
- display of a badge that could be earned (a badge class) that references the badge's endorsements
- display of the description and criteria associated with an endorsement
- metadata about standards alignment in the endorsement
- discovery of badges based on their endorsements
- analytics about endorsements

The implementation of endorsements utilizes the JSON-LD extension specification. Endorsements require a badge class to be created by each endorsement issuer for each endorsement. Technically an endorsement is a special type of badge, using the foundations of badge class creation and issuing. This special endorsement type of badge class is used to endorse another badge object (a specific Badge Class, Badge Issuer, or Badge Assertion).

The endorsement extension is added to an assertion whose recipient is the IRI unique identifier of the endorsed badge object. Endorsers may use one general badge class for all their endorsements, or they can create as many different badge classes as they need for different types of endorsements; the more specific the endorsement, the more useful it is likely to be. Consumers can get information from both the badge class's description field and the assertion's endorsement description field. The extension provides the option to embed the entire endorsed object to protect against cases where the endorsed badge object is later changed by its issuer. Specific examples of how this is implemented are in the Open Badges Technical Specification (Badge Alliance, 2015).

Notably, badges are not required to have endorsements. There are many types of badges and purposes for them, and not all badges need to—or should have—third-party validation. Conversely, badges can also have multiple endorsements. Many different organizations could endorse the same badge for different reasons, based on different criteria, or simply because the badge is broadly valuable. Endorsement practices will evolve based on where and how they provide value, and tools and services will be developed to enable easy parsing of all the additional data.

Technical infrastructure and analytics can further understandings of how endorsed badges are being used or pursued; ultimately the value of endorsement will be mediated by multiple stakeholders in the open badges ecosystem, and this mediation is facilitated by the technical interoperability of the Open Badges Standard.

5 Scenarios for Badge Endorsement

The intentionally open structure of badge endorsement provides opportunities for a variety of different types of endorsers, including community organizations, employers, standards bodies, and groups that are re-envisioning how the value of learning is defined. Endorsers are organizations with the expertise or interest to analyze the quality of specific badges, including how a badge is defined, the manner and degree to which a badge earner is assessed, and the qualifications of the badge issuer to structure and evaluate the learning achievement represented by the badge. There is no screening process for endorsers; social community structures and consumer recognition will determine trusted endorsers, just as they determine trusted badge issuers.

While real world implementations of badge endorsement are yet to emerge, it is useful to visualize potential (fictitious) scenarios in order to provide a realistic representation of the value of endorsement among stakeholders. These scenarios represent a coherent set of stakeholder perspectives for one approach to endorsement. But this is just a slice of the possibilities for endorsement.

5.1 Badge Earner

Emily is an employee at Health Service International (HSI). HSI pays 50 % of the cost associated with professional development as long as the employee provides evidence of learning from a trusted third-party source and receives supervisor approval in advance. One option HSI accepts for such evidence is any badge endorsed by the Healthcare Education Alliance (HEA), an industry association that offers a professional development rating service for providers and specific learning modules. Emily uses a search feature on the HSI website to find a list of badges endorsed by HEA. There she finds a badge titled Palliative Care Communications that is issued by Horizon Learning and endorsed by HEA. Believing her job effectiveness would be improved by increased knowledge of this subject, and the stress level of all parties, including concerned family members, would be lowered during in-home palliative care visits, she selects this learning module. Upon her selection, the system sends an approval request to Megan, Emily's supervisor, who promptly reviews and approves it. The system then notifies Emily that she is ready to start and provides a link to the learning module on Horizon Learning's website. Emily takes the learning module, earns the HEA endorsed badge and HSI pays for 50 % of the approved professional development.

5.2 Badge Issuer

Sarah develops learning products for Horizon Learning. She knows that the content and modules she creates are relevant to current healthcare industry needs and that learners significantly improve their understanding and competencies by participating. Because of this ongoing success combined with her commitment to improving healthcare education and continuing professional development, she works to ensure that Horizon Learning's products are broadly accepted by employers. Her work with the Healthcare Education Alliance (HEA) has resulted in their endorsement of Horizon Learning's badges. She went through several rounds of badge revision to ensure that Horizon Learning's badges met all of the criteria specified in the HEA evaluation process. These new endorsements make it more likely that healthcare organizations like Health Service International (HSI) will readily accept them for their employees' professional development. Sarah is proud that their badges have met HEA's rigorous endorsement criteria, including expert alignment to standards. Now her company and others in the ecosystem can see the increase in usage of these endorsed badges and understand that they contain the type of evidence needed to ensure the earners of the badges have achieved valuable, well-defined competencies.

5.3 Badge Endorser

Jonathan is the member services director at Healthcare Education Alliance (HEA). HEA has long had an evaluation process whereby learning providers can apply to have their professional development offerings reviewed by trained evaluators using well-defined rubrics. HEA has extended this process to include evaluation of badges. Jonathan's team has previously worked with Horizon Learning to evaluate their professional development learning modules. Recently Horizon Learning applied to have their new badges evaluated. Jonathan's team evaluated Horizon Learning badges with the same rigorous process his organization applies to offerings from various professional development learning providers. As a trusted industry association, HEA knows that their members rely on them for this type of valuable evaluation so that businesses don't all face the daunting task of screening the many different learning providers. Their role as an industry association also gives them the expertise needed to evaluate how specific learning modules are aligned to industry standards. The number of employers accepting badges is growing, and each month Jonathan publishes a list of HEA-endorsed badges as well as a chart showing the number of all HEA-endorsed badges issued that month, together with information about their associated badge issuers. This information helps HEA members understand and visualize the learning opportunities represented by badges. Jonathan and his colleagues see that HEA members are deriving considerable tangible and intangible value from badge endorsements.

5.4 Badge Viewer/Consumers

Jeremy is a recruiter at Health Service International (HSI). He is working on an early-stage sourcing project aimed at finding ten qualified candidates for HSI's North Atlanta team. He has access to a national database of over one million active job seekers. This database includes references to badges earned by job seekers listed in the database. He also has access to a sophisticated sourcing system that allows him to filter job seeker profiles based on badge characteristics. So far, his profile filters have narrowed the qualifying candidates to 1322, which is still way too many for him to manually review. So he adds an endorsement filter to show only the badges endorsed by HEA and/or Northstar Ratings, another cross-industry badge endorser HSI trusts. Now Jeremy sees that the qualifying candidate list has been reduced to 42. Jeremy decides to start the next sourcing phase using this list of candidates.

Melinda manages the Health Service International (HSI) professional development program as one of her HR responsibilities. She has access to an HR management feature that enables her to quickly chart by month the badges issued to HSI employees. There's also an endorsement filter option on this charting tool. Melinda is able to quickly filter issued badges to only those endorsed by HEA. She notices that not only has the number of HEA endorsed badges been increasing in 11 of the past 12 months, but also that the ratio of HEA endorsed badges to total badges earned by HSI employees has also increased from 2 % in the first month to over 44 % in the most recent month. For Melinda this confirms that the HR team's goal of using endorsements to steer staff toward quality learning providers is working.

6 Conclusion

The endorsement function was introduced in response to numerous inquiries and requests from the open badges community. As of this writing, the release of the endorsement specification is relatively new. The development activities leading up to release of the specification included prototypes for a number of test cases. But a significant body of endorsed badges has yet to be developed, and research about the impact of endorsement in the field lies in the future.

Nonetheless, the future potential of endorsement is clear. With the addition of the Endorsement function to the Open Badges Standard, the value of every badge can be more readily ascertained. Third-party evaluators/consumers from employers to university admissions officers to professional credentialing associations can independently evaluate whether a badge and the criteria it represents bring value within the context that the consumer operates. Issuers gain credibility in the marketplace when the badges they offer are recognized and endorsed by a third-party who has evaluated their offerings. Multiple issuers can co-exist within the ecosystem, with the knowledge that the individual badges that an issuer puts forward will be evaluated against the same standard as their counterparts, and all badges that meet a consumer's criteria are eligible for endorsement and, thereby, discoverable by badge earners. Badge earners gain trust in issuers through the third-party recognition that endorsement provides. As a result, the overall soundness of badging ecosystems is strengthened.

Acknowledgements Although this chapter lists four authors, in fact this work relies heavily on the broad-based community work of scores of people in the Badge Alliance Working Groups for Endorsement, co-chaired by Deborah Everhart and Carla Casilli, the Open Badges Standard, co-chaired by Chris McAvoy and Sunny Lee, and Messaging, co-chaired by Sara Isaac and Megan Cole. Bringing this material into a book with broad circulation is our tribute to the hard work of these teams. In particular, portions of this chapter are drawn from "Badge Endorsement: Getting Started" and the "Open Badges Specification," both of which are collaboratively produced and available for public use and remix under a Creative Commons Attribution-ShareAlike 4.0 License (http://creativecommons.org/licenses/by-sa/4.0/).

We would also like to acknowledge more generally the Badge Alliance, a network of organizations working to grow and evolve a self-sustaining open badges ecosystem.

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Chapter 13
Implementing a Badging System Faculty Development

Jordan Hamson-Utley and Errin Heyman

Abstract Badging can be used in higher education faculty development efforts to demonstrate accomplishments. Badges can also serve as a powerful motivator for some faculty seeking improvement and to demonstrate growth. This system can be connected to aspects important to the faculty role, including rank, tenure, merit raises, and demonstration of university and community service. Badging can also offer a powerful way to examine current faculty development endeavors, helping to determine effectiveness or return on investment.

Connecting badging with mentoring and peer review can be another way to incorporate badging into overarching faculty development. By tracking and displaying badges earned, mentors and mentees can make connections more easily, allowing for more specializing and "just-in-time" training. Teaching is a profession that thrives upon continual professional development; digital enterprises are getting into the game by developing micro-credentialing systems that offer the ability to organize, capture, credential, and share achievements of teachers across their careers (Digital Promise: Accelerating Innovation in Education, Educator micro-credentials. Retrieved June 25, 2015 from http://www.digitalpromise.org/initiatives/educator-micro-credentials#educator-micro-credentials, n.d.).

The authors will explain how badging can be applied in academic and non-academic settings; however, the focus is on preparing a university to use a badging system that is linked to faculty development and mentoring. The authors will offer a review of four current badging platforms. Ultimately, the authors will highlight models in which badging can be designed and implemented for the purpose of empowering and motivating faculty.

Keywords Faculty development • Performance • Evaluation • Mentoring • Implementation • Mapping

J. Hamson-Utley (✉)
University of St. Augustine, St Augustine, FL, USA

School for Advanced Studies, University of Phoenix, Tempe, AZ, USA
e-mail: Jutley@usa.edu

E. Heyman
University of St. Augustine, St Augustine, FL, USA

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1 Introduction

1.1 Definitions of Badging Related to Faculty Development

Digital badges can assist with promoting, tracking, and organizing pathways within faculty development models. At the most elementary level, badges serve to capture and communicate achievements (Mozilla Foundation, 2012), validate accomplishments (Jovanovic & Devedzic, 2015), and encapsulate micro-credentials (Shen, 2014). As such, badges assist employers in finding employees with essential job-related skills (Raths, 2013) and colleagues in finding each other on campus. Badges can be used toward recognition of completed tasks and learned skills and are a way to showcase talents (Wu, Whiteley, & Sass, 2015) in efforts to connect a learning community (Ford, Izumi, Lottes, & Richardson, 2015).

Many faculty development models fail to promote enthusiasm, "ownership," and cannot close the loop following completion of a training or development series, potentially limiting the effectiveness of that and future trainings (e.g., attendance, implementation, post-training). What's more, traditional models of faculty development fail to meet the needs of faculty in the twenty-first century (Sullivan et al., 2013). Also a challenge, funding for faculty development is frequently the first thing to be cut in budget reductions, often because there may not be tangible evidence of usefulness or perceived return on investment (ROI). Recent research suggests that face-to-face (F-2-F) professional development is preferred over online learning (Hahn & Lester, 2012); however, hybrid versions of faculty development offerings include a mix of F-2-F and on-demand, self-paced delivery formats (Brooks, 2010). Badges can play a vital role in documenting both types of activities, F-2-F and online.

Badging serves a purpose in higher education faculty development by allowing faculty to earn peer and university leadership awareness of professional development activity. Badging can be used as evidence of accomplishments by providing a visual display of learned skills (Sullivan et al., 2013). Badges may serve as a primary motivator to faculty who seek to improve their skills and to demonstrate having done so. Badges can indicate such accomplishments as rank, tenure, merit raises, and university (e.g., mentoring, peer review) and community service (e.g., providing services based on badged qualifications), to name a few. Badging can also offer a powerful way to examine current faculty development endeavors, helping to determine effectiveness of events or interventions, and allow for revisions and subsequent offerings.

Connecting a badging system with a university mentoring program can be another powerful way to incorporate badging into the overarching faculty development schema. Through "publishing" faculty accomplishments and expertise via badges, mentors and mentees can make just-in-time or need-based connections more easily. One way to publish badges is through a leaderboard; Texas Wesleyan University provides an excellent example (http://www.txwescetl.com/leaderboard/).

In this chapter, the authors will explain how the models can be applied beyond academia through illustrative parallels. Section 5 will also offer suggestions of badging programs/platforms/packages through reviews of four existing systems that may be useful within and across job and university settings. Ultimately, the authors will highlight ways (models) in which badging can be designed and implemented for the purpose of empowering and motivating faculty, connecting university peers, and connecting the university to the community.

2 Purpose of Badges

There are many ways to track accomplishments in higher education. In most academic settings, tracking what a professor has accomplished is often required and related to tenure. Some academicians refer to the tenure process as "bean counting" or describe the process as "a rat race." Considering both of these common analogies a bit further, the first implies getting as much done as possible (e.g., the biggest pile), while the latter refers to the unorganized, rampant overstuffing of folders in attempts to win in a peer comparison. Due to the overwhelming nature and length of the process, personal organization (including constant tracking of tenure/promotion-worthy activity), becomes essential. Badges may offer just that: an organized way to consistently, even automatically, track achievement/activity and show evidence of progress (to peers or tenure reviewers) in professional development.

A secondary purpose of badging is to share accomplishments with a broader community (Raths, 2013; Wu et al., 2015). A badge has the potential to efficiently and accurately identify resources or people with skills in the campus community. This can be especially useful for new faculty or those learning new skills, be it in the classroom or in the research laboratory. Furthermore, sharing faculty expertise through badging aligns well with ePortfolios (Glover, 2013) and digital tenure file systems—in addition to serving as an artifact illustrating mastery of skill or experience, a badge may also operate as a clickable link to a description or summary (Buckingham, 2014).

There are many additional reasons to get into the badging game (e.g., student motivation, engagement, and enrichment, learning objectives and assessment, skills in Bloom's affective domain); however, the main focus of this chapter is badging use in faculty development.

2.1 No Lunch, No Learn

In some cases, motivating faculty to attend faculty development sessions may be as simple as providing pastries from a local gourmet bake shop. However, many faculty are driven by more complex factors than those at the bottom of Maslow's hierarchy (i.e., physiological needs). What is it, then, that motivates faculty to attend professional development sessions? Since getting faculty buy-in is essential to a successful professional development model, it is important to understand the concerns of faculty as they approach innovation and change, both of which are historically difficult in higher education. Often, all it takes to get faculty to engage is to offer support and to provide recognition of the work completed (Garrison & Vaughn, 2013).

Drawing from past experience as the director of a teaching and learning center at a large university in the West, I found that if the center tracked attendance *for* the faculty member, the number of faculty at events went up. Let me share a little more about this technique and connect it to how badging can assist further. Using an online sign-up system for faculty development events, the center collected names of those who actually attended the event and generated an archived digital list. At the end of the academic year, each attendee received a letter from the center, which served as an organized summary of *all development sessions* attended during that year. The subsequent year, event numbers increased significantly, and faculty began to request letters early. What might this example suggest? One possibility is that if the center is willing to do the bean counting *for* the faculty member (or attendee), that they will step forward to earn the badge. These badges can then be listed in a central location to enable faculty connection across department, colleges and schools. Faculty in higher education often find themselves working in a silo, not knowing the skills of the individual "next door;" badging stands to change this isolated atmosphere by advertising what skills and tasks individual faculty have accomplished so as to connect like-minded folks on bigger, better projects.

The roots of many badging platforms include the idea that individual skills or sets of skills could be highlighted and organized in such a way that potential employers could search and find individuals who hold those skills (Sullivan, 2013; Wu et al., 2015). Furthermore, contemporary literature describes badges as a way to qualify or validate the recent college graduate in ways that a degree transcript cannot (Grant, 2014; Young, 2012). Skills, especially soft skills that cannot be properly documented by a grade in a college course or a degree certificate, are a perfect example of what to badge.

2.2 What About a Badge?

Many educators appear interested in badging as a motivator of life-long learning; this is not a surprise when considering the common methods, such as stickers, stars, and stamps, that are used as motivational tools across educational systems (Buckingham, 2014).

In addition, the military has been using badges for hundreds of years, worn on the uniforms of soldiers to note achievement and experience level (NRC, 2012); there is an element of pride attached to displaying achievement. Drawing on personal experience in a higher education organization that utilized badging, badges served as a way to share accomplishment and to document progression across a timeline. Similarly, the Girl Scouts of America has used award badges since 1916

(Girl Scouts, n.d.) and continues to do so to mark achievement. Of special note, while troops (small, localized group) within the organization can focus on certain badges, the individual scout also gets to select the badges that she finds most interesting and useful (Sorensen, 2013). Autonomy in goal selection plays a role in motivation to seek the badge; this is evident is models that focus on learner capabilities (Lozano, Boni, Peris, & Hueso, 2012). Similarly, since 1908 the Boy Scouts of America have followed a model that culminates in the highest achievable honor, the Eagle Scout badge (NESA, n.d.). In a recent study on how boys receiving this top honor differed from those not enrolled in Boy Scouts, researchers found a significant difference across all goal-oriented behaviors including lifelong learning and personal, professional, and spiritual goal achievement (Jang, Johnson & Kim, 2010).

The badge-unmotivated individuals (faculty) are often those who are critical of the model, at the root. Criticisms to badging models have surfaced; for example, faculty purporting that "We're adults…we don't need badges" (Hart, 2015). This criticism points to a need for framing badging in a useful way when discussing the effort with faculty (or group members). Highlighting badging as a way of sharing expertise, an avenue to make connections on campus with like-achieving folks, or even to seek out those doing what you'd like to, may increase faculty buy-in from the start.

An additional criticism stems from assessment of the skills needed to earn the badge and the authority of the agency awarding the badge (Grant, 2014). Assessment must be thorough and validate that the learning occurred; many university student badging models have been reported to use rubrics associated with student learning outcomes to validate the completion of the badge (Wu et al., 2015). Alongside this, employers are also faced with interpreting what the badge says about the holders' skills (Jovanovic & Devedzic, 2015).

2.3 Show *What You Know*

For those moving beyond their terminal degree achievement, badges may serve as a way to document life-long learning in a way that can be measured in the tenure process. Recent legislative talks concerning removing tenure from higher education due to the lack of productivity once tenured, highlight the potential use for badges as a way of tracking and showcasing achievements of both hard (e.g., awards, research, publications) and soft (e.g., personal growth and community service) skills post-tenure.

Ranking systems are also needed in higher education to establish leaders and identify service skills development through years of engagement in the university. Instructors and contributing faculty (adjunct faculty) also can achieve rank in the university setting, and this is a hotbed for any badging model to take shape. Most departments on a university campus utilize instructors and/or contributing faculty. When it comes time to assign a course, what establishes who gets the class? Years of service? Skills and qualifications? A criticism of the high utilization of contributing faculty in higher education is that they are just not as plugged-in to their role, they are unavailable to students, and they have a negative impact on student learning outcomes (Jeager, 2008).

Consider a professional development program that offers a set of skills linked to badges that would provide the lacking aforementioned skills to contributing faculty and instructors. Examples of such badges are as follows: (1) video-conferencing, where contributing faculty would learn and master the technology that would enable them to connect with students; (2) open educational resources (OERs), where contributing faculty would be exposed to OERs and learn to locate additional resources to supplement their classroom or online teachings; (3) Blackboard, offering advanced training in the learning management system by which the contributing faculty member instructs and communicates with students. Though these are only a few examples of badgeable skills useful for contributing faculty, badges can be the system that documents who is the best equipped contributing faculty member to teach the upcoming fall class. This badging model may also provide the data needed for advancement in rank, merit raises, and access to full-time employment.

Consider the need to select a high-performing committee member from an available pool of assistant professors, all of whom need university service to advance in the tenure process. Badges could serve many purposes in this scenario. The selection committee could examine equally ranked applicants by comparing the badges that they have earned since joining the university (and potentially prior to that time based on the badging system). The skills needed to make an impact on the committee could be searched and the best candidate selected. This scenario expands beyond the assistant professor rank to that of full professor (e.g., Fullbright Scholar badge), to outside of academia.

Service, of any sort, is not well documented in the university community. Although service is a required aspect of achieving tenure at most academic institutions, it is usually the least weighted category. A recent published manuscript can be hung in the glass display case in the hallway; however, the service role and function of many faculty on campuses nationwide goes unnoticed. Some service roles require many hours of work, equivalent to that of writing a manuscript. Badges can support the group of faculty service achievers by documenting and publishing accomplishments in badge form such as *University Chair*, signifying the chair role on a university committee. The badge can serve a second role, beyond acknowledgement of service, by identifying the individual to which questions, forms, and documents must be submitted.

2.4 Mapping Out What to Badge

What do you do when you want to go somewhere but you don't know how to get there? Get a map. For instance, Texas Wesleyan University provides a map to guide faculty members toward mastery of various categories of badgeable skills (http://www.txwescetl.com/pedagogy-map/). A visual interpretation of a development

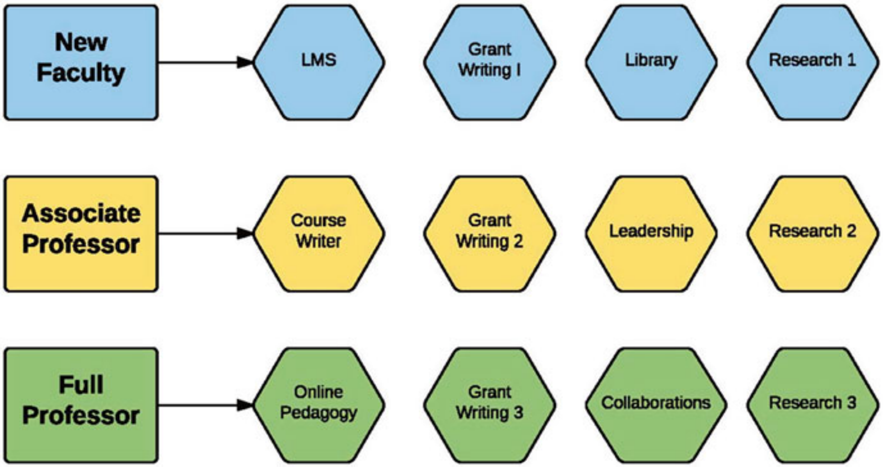

Fig. 13.1 Badging timeline map (Utley, 2015)

plan is highly useful for those who wish to see the pathway, or the direction that the development may take them, opening doors along the way to new opportunities. A map like the one used by Texas Wesleyan University is a great way to provide this direction and to offer a specified route to achieve a set goal. The map can also work in reverse, as a reflection tool and a way to visualize what has been accomplished as well as the distance traveled and ground covered.

Another way to visualize a badging model would be to use a timeline approach, from the point of being hired as a new faculty, to becoming tenured, to achieving post-tenure specializations. Badges could be grouped by skills needed at each of these time points in the career of an academician (see Fig. 13.1). A pyramid visual, one like Maslow's hierarchy, could also be utilized. With this, visual badges would be grouped on levels, moving up to the next echelon, after all, or "2 of 3" badges have been earned (see Fig. 13.2). The favorite approach of the chapter authors is the map, because it divides skills into continents and creates explorative interests, rather than grouping by faculty status or length at the university, as both of these models have inherent assumption faults.

3 Applications of Badging for Faculty Development

Digital badges, in an academic or training setting, are graphical representations of learning experiences and display learners' skills and education. They often contain metadata about outcomes and competency levels (Gamrat, Zimmerman, Dudek, & Peck, 2014).

While digital badging is rooted in non-academic areas—in the gaming industry, primarily, then morphing to micro-credentialing for training, businesses, etc.—

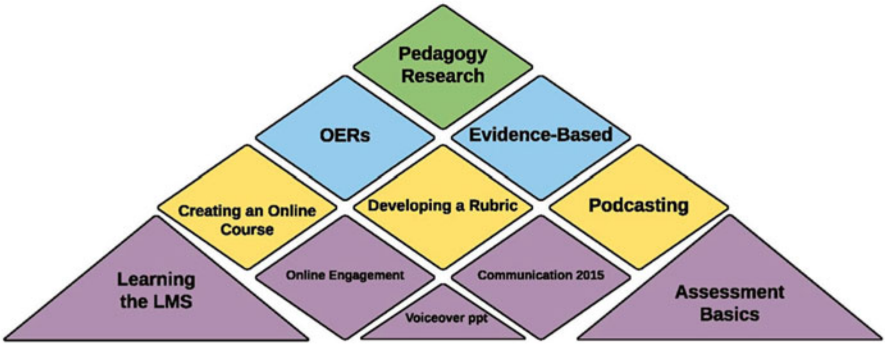

Fig. 13.2 Badging pyramid map (Utley, 2015)

badging is moving into the realm of academia (Gamrat et al., 2014). Over the past few years, the bulk of badging for education has focused on student use, more than for faculty (Gamrat et al., 2014; Grant, 2014). However, there lies great opportunity in uses of badging approaches for faculty development endeavors; in fact, several institutions are already using these types of approaches, such as Ashford University, Empire State College, Texas Wesleyan University, and Penn State.

At the University of St. Augustine, a badging pilot for faculty development is already underway. The creators anticipate building a more holistic system whereby badging is linked to rank and promotion through the ability to engage in and track important activities, such as university and community service, mentoring and peer review, and internal university faculty development as well as external professional development. Another benefit of a badging system is that it grants faculty the ability to search for mentors based on their acquired skills and/or attributes, which allows for quick identification of mentoring opportunities and pairings of appropriate skill-sets and expertise in various areas for professional development.

At the University of St. Augustine, the effectiveness measures for badging activities/development are based on the "Evidence of Learning" Framework, put forth by the Tyton Partners (Tyton Partners, 2015) in the white paper, *Evidence of Leaning: The Case for an Integrated Competency Management System for Students, Higher Education, and Employers*. This framework allows evaluators to assess the elements of a program or system (such as badging). The framework has the following components:

[Experience:] "Process of learning, either formally or informally; any effort that may be captured as evidence or credentials" (p. 10).

[Validate:] "Act of assessing and recognizing experiences for academic credit or qualifications" (p. 11).

[Assemble:] "Process of capturing and curating evidence of learning; creating insights based on networks of experiences/evidence" (p. 12).

[Promote:] "Act of marketing assembled evidence and mechanisms for creating matches between candidates and opportunities" (p. 13).

[Align:] "Process of securing feedback to enhance and refine performance and capabilities; may lead to pursuit of new opportunities within the experience segment" (p. 14).

It may be worth noting that the direct language from this framework is not necessarily geared toward educators ("marketing," for instance, may not resonate with faculty); however, the intent behind the framework can easily be translated to an academic setting. That is, if we subscribe to this framework, one that *applies recognition of competencies through validating evidence of learning,* then this approach to badging makes sense for faculty development, just as it would for student micro-credentialing. That is, a successful badging program for faculty development would need to incorporate demonstration of each of the framework items to help ensure usefulness to individuals, across many departments, and perhaps across multiple institutions.

3.1 Tracking Development and Applying Service

Most institutions of higher education require professional development of some kind for faculty. Additionally, many accreditors (professional, programmatic, regional and national) have faculty/professional development expectations (Gamrat et al., 2014; Saroyen & Trigwell, 2015). Motivation for faculty to continually update and upgrade their development often wavers, especially at institutions where it is largely left up to individual instructors to maintain. Tracking, then, is often incomplete. A systematic faculty development program, either university-wide or program-wide (depending on the size of the institution), can support intentional development opportunities; however, they may still leave faculty less than motivated to fully engage, let alone inspired to implement new strategies in their own classes. Motivation depends on many aspects, but helping to "publish" accomplishment and expertise has proven successful for some institutions (Glover, 2013; Hahn & Lester, 2012).

It is not only important to incentivize learning, but it is necessary to connect learning with validated activities and achievement of outcomes tied to activities (Gamrat et al., 2014). Additionally, customization is an important motivational factor, which ties to learner empowerment (Gamrat et al., 2014). Accountability is also a critical factor for motivation. In terms of a learning framework, accountability includes learning that is meaningful, has professional association, and denotes continual improvement (Darling-Hammond, Wilhoit, & Pittenger, 2014).

Schenke, Tran, and Hickey (2013) noted that the following components should be built into a badging system in order to motivate learning:

Provide privileges: "if the privilege granted for earning a badge is not associated with something the learner values, he or she is unlikely to engage or persist in the activity associated with earning that badge" (Schenke et al., para. 5). In other words, badging should lead to something beyond the badge itself. For the University of St.

Augustine, the intent is for badging to be connected with tracking toward evaluation of faculty toward rank and promotion.

Recognize identities: "badges can recognize a learner's role within the badging system such as recognizing their specialization in journalism, engineering, or peer mentoring" (para. 6). For the University of St. Augustine, badges will tie not only to faculty development activities, but will be used to display expertise in various areas—such as mentoring.

Promote (and recognize) engagement with communities: "Engagement in the community can be seen to promote [learners'] motivation to continue on activities because learners are relating to others" (para. 7). *Service to the profession* and *service to the University* are important elements for faculty at the University of St. Augustine. The badging system will need to be able to not only track these activities but should also be able to promote engagement to the rest of the faculty community—and perhaps beyond.

Display badges to the public: "Public display can have a positive or negative effect, depending on the learner—sometimes public display can incite competition, and for some people, this is a good thing; for others, it may create a negative reaction" (Schenke et al., p. 45). For the University of St. Augustine, the intent is to share badges and accomplishments within the internal community only, and largely for the peer mentoring endeavors, so that faculty seeking mentorship can easily identify other faculty who are the best matches.

Recognize different outcomes: The type of learning that a badge recognizes and the way that recognition is managed has profound implications for motivation….Some badges are awarded for meeting some criterion (performance-based), while other badges are awarded for engaging in some activity ("effort-based")….It seems likely that recognition of social learning will operate very differently in effort-based versus performance-based contexts (para. 14).

It is important to determine types of outcomes and how those achievements are displayed.

Utilize different means of assessment: The type of assessment has significant consequences for motivation. For example, having an expert versus a computer conducting the assessment communicates different expectations to the learner. Knowing that your peers are assessing you is very different than knowing a computer is assessing you (para. 15).

Assessment approaches not only affect motivation, but they affect validity and the overall integrity of a badging system.

For the University of St. Augustine, a systematic badging system for faculty development not only tracks applicable service and development activities, but it also motivates faculty to engage in more activities and implement newly gained skills or strategies into classrooms, thereby working to drive continuous improvement of student learning outcomes.

An example of a badging approach, which can be built upon the "Evidence of Learning" framework (Tyton Partners, 2015), as well as the guidelines toward motivation, was developed specifically for faculty development by the Center for Excellence in Teaching and Learning (CETL) at Texas Wesleyan University. Their badging system is comprised of five phases, which include "challenge cards" (CETL, 2015). These challenge cards add activities and implementation suggestions based on the badge/activity awarded. Faculty are awarded badges after first attending a workshop or consultation with the CETL staff, then faculty are issued the challenge card and then awarded an upgraded badge based on completion of the challenge. After this, faculty are given another challenge/activity to complete, after which faculty are asked to share their knowledge with the university community—this leads to issuing the "phase five" badge (CETL, 2015).

As another example, Penn State developed a digital badging system, called Teacher Learning Journeys (TLJ). This is "an approach that allows for teachers to customize their PD [Professional Development] experience to their workplace and make decisions about what PD they need based on their expertise and interests. The digital badging provided and assessed experiences in online PD" (Gamrat et al., 2014, p. 1). The Penn State system also adds "stamps" to the badges that faculty could earn. These stamps represented a lower level of achievement than a badge, and a series of stamps could earn the faculty badges. To earn badges, faculty needed to demonstrate application of concepts to their roles (Gamrat et al., 2014)

Faculty at Penn State had two choices regarding levels of assessment of their skills. Stamps represented a lower level of achievement, whereas badges required self-reflections tied to their jobs (Gamrat et al., 2014). Faculty also were asked to create goal statements, and PD activities were based on those individual statements (Gamrat et al.). At present, the University of St. Augustine is considering allowing faculty to create some badges of their own.

Successful professional development will meet individual faculty needs, which means catering to appropriate levels (undergraduate, graduate, etc.), and it should be "adaptive to various teaching philosophies and pedagogies, and provide flexibility" (Gamrat et al., 2014, p. 2). A successful badging system related to faculty development should offer these components.

3.2 Mentoring and Peer Review

As discussed, badging allows for a system to gather information, track information, and disseminate the information to a larger academic community. Not only does badging allow for the tagging of competencies, but it allows the administrator of the system to display who has earned what badges, through a leaderboard scenario or "Faculty Directory." A faculty directory can act as a repository of information for those seeking a mentor or a peer with like interests and can be very influential in building relationships across a university or organization.

At the University of St. Augustine, a mentor/peer review program is being developed at the same time as the badging endeavors. The two will have intentional connections. That is, training and development for mentorship and peer review will be one type of "badgeable" event, tracked on the directory. Faculty who wish to become mentors for other faculty will go through a series of training/development on mentorship skills, and each additional step will be eligible for a badge of varying levels (beginner to advanced-type leveling). Completion of a web-based training will earn the faculty member a badge, completing an assessment will earn him/her another, taking on mentees, another, and so on. These badges will be displayed on a directory so that faculty members who are searching for mentors and/or peer reviewers will be able to identify not only content-based skills (e.g., discipline-specific expertise, teaching, learning and assessment expertise) but mentoring and peer review "levels" will also be displayed. In addition, the badges can be tracked for purposes of faculty evaluation (especially as related to professional development) and, potentially, promotion.

Penn State's badging system, addressed earlier, through its Teacher Learning Journeys (TLJ) efforts, also has a mentorship component: "TLJ supported teacher interaction with … mentors who both led the PD activities and assessed their activity logs to earn either a badge (high level of achievement) or stamp (low level of achievement)" (Gamrat et al., 2014, p. 11). Additionally, "One role of the expert mentor was providing access to resources and practices valued by the community of educator that these teachers belonged" (p. 11). One can earn badges through the very act of engaging in mentoring or peer review. In fact, Gamrat et al. (2014) noted that the interactivity between mentor and mentee was a critical component for making connections to these experts in their fields. For instance, it was found that mentors needed to supply guiding feedback for the mentee to continue toward their own goals.

Having badges displayed on a directory site should allow for faculty at University of St. Augustine to foster learning communities. The directory could become a community site in and of itself!

3.3 Rank and Promotion

The idea of connecting badging and professional development activities that can lead to earning badges with faculty evaluation—specifically, incorporating badging into the rank and promotion processes—has already been discussed. However, this is a critical factor toward promoting faculty and program director (those who manage faculty) buy-in at the University of St. Augustine.

The university is considered a "teaching institution" (versus a research institution); therefore, it does not have a tenure system. However, instructors are ranked, and there are clear expectations and outcomes that frame the promotion process. Certain criteria and activities are required in order to reach higher ranks. Currently, the tracking and rating of professional development, service to the community and to the university, and other key elements considered when faculty are "up" for review are rather hit or miss. That means that preparing for a faculty review often becomes a lengthy and tedious endeavor, both for the faculty and their managers. One reason for a systematic badging system is to enable a more efficient, centralized process. Furthermore, recorded faculty activities will likely make accreditation visits and processes more efficient as well.

While efficiency is a key factor to consider for a badging system, the ability to measure the effectiveness of development activities is also a critical component.

3.4 Measure(s) of Effectiveness

Return on investment (ROI) is a decidedly *un*-academic term; however, with ever-decreasing budgets, across almost all sectors/types of education, it is now, perhaps more than ever, crucially important that development activities are meeting the needs of not just the faculty, but of the institution overall. In fact, "In response to … misalignments, numerous companies, organizations, and initiatives have emerged to help individuals, institutions, and employers more effectively capture, present, and evaluate what individuals have learned" (Tyton Partners, 2015, p. 7).

Ultimately, for a training/professional development badging system to have a significant impact, the activities must yield a change in the overall organization, or "Results," as designated in Kirkpatrick's Model of Training Evaluation (Kirkpatrick & Kirkpatrick, 2006). Kirkpatrick offers one framework through which professional development can be evaluated. In this case, the badging system itself could also be evaluated using the model (with the target of achieving the "Results" level). As a reminder, the Kirkpatrick Model has four levels: Reaction, Learning, Behavior and Result (Kirkpatrick & Kirkpatrick). For an institution of higher education, specifically for the University of St. Augustine, the desired *Results* would be to have an influence on improving student learning outcomes throughout all programs at the university.

Saroyen and Trigwell (2015) built upon Kirkpatrick's model for academic use. They noted that four conditions should exist to yield effective results: learners need to acknowledge any gaps in knowledge and be compelled to gain new knowledge; learners should understand and value the connection between what will be gained through a new learning activity and the perceived worth of the investment of time, money, etc.; learners should know how to make changes in their own behaviors, skills, etc.; and there should be intrinsic or extrinsic (or both) motivators for learners to make changes.

A badging system needs to be accessible, sustainable, and, perhaps most important, meaningful to all stakeholders involved. This is why the intentional connections among various components and outcomes, and the associated badges, have been carefully considered by the University of St. Augustine in the creation of the badging system. While a system with broad connections may take longer to implement, the end result should be a system that allows those who implement to see results that have an influence at a deep organizational level. Saroyen and Trigwell (2015) noted that while one-time events may be more scalable, they are less likely to make much of a difference on a larger body of faculty/learners. On the other hand, they noted that initiatives spread out over time may have an impact on participants, but should be managed on a small-scale in order to be manageable, especially in terms of resources.

Organizational support is critical for training and development to have deep, lasting impact as well, and the university will need to assess student learning as an ultimate test of success of any initiatives (Saroyen & Trigwell, 2015).

4 Implementation of Badging Models

The first step in considering implementation is alignment with needs and goals of the university or program (NRC, 2012). Some university programs may wish to dictate a set of badges required to take on a certain role or level of duty (e.g., University Committee Chair), while other models would be more open selection, based on the learners' interests and desires. The first model is a competency-based model (Ford et al., 2015), while the second is more parallel to a capabilities approach (Lozano et al., 2012). When considering tenure and promotion as a need or goal, the competency-based model may be more appropriate. When documenting life-long learning as a sole goal, the capabilities theory may be best suited to model this approach.

4.1 Academia

When considering what is a suitable activity to badge, a university or center for teaching and learning may choose to look at its mission and consider values that it holds at its core. For example, if a mission statement reads "The mission of the University of St. Augustine for Health Sciences is the development of professional health care practitioners through innovative, individualized, and quality classroom, clinical and distance education," then badgeable activities could be categorized into Innovation, Student-centered, Quality, and possibly Online or Distance, all pertaining to educational methods and student outcomes. To develop it one step further, individual badges that fall under each category or element of the university's mission should take shape and make intuitive sense.

Consider that a university wants to move a few academic majors to a completely online course delivery format. The following questions come to mind: *How will "good" online faculty be identified? What training do they need? How will they be trained? How will this be tracked?* First, the qualities of a good online instructor need to be gathered and categorized. From this, a blended professional development model (see Sullivan et al., 2013) could effectively deliver needed skills, and badges could track the completion of training and readiness to begin online course instruction.

Another approach to *identifying the purpose* of implementing a badging system would be to attach the badges to a new theme or movement at the university. For

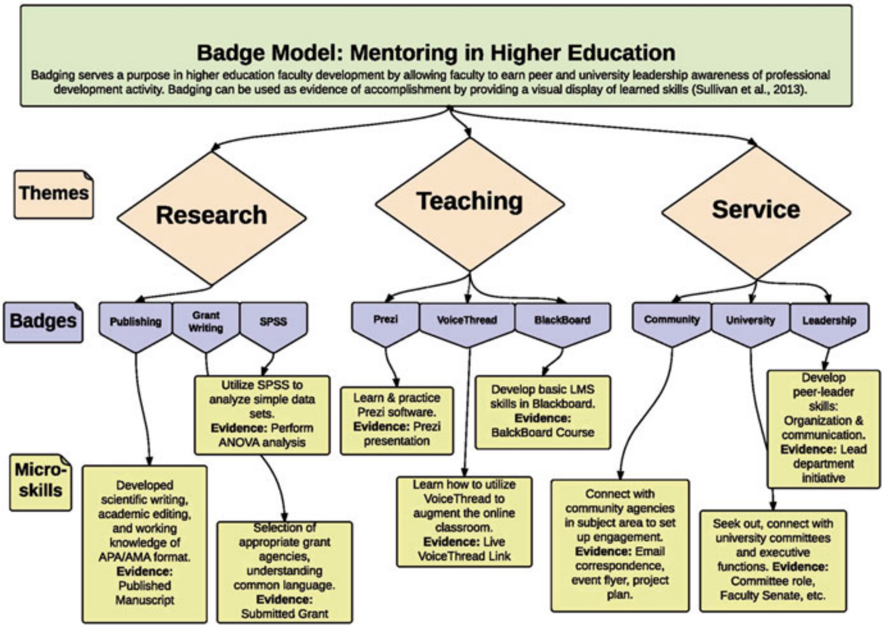

Fig. 13.3 Badging themes map (Utley, 2015)

example, if the university is attempting to improve its mentoring program by connecting new and current faculty with the goal of improving faculty retention, classroom teaching effectiveness, or interdisciplinary collaborative research, badged activities can be designed in concert with that overreaching goal. A common theme of universities is to achieve tenure through research, teaching and service contributions. A badging themes map can outline those areas and direct faculty to activities that shape their progress toward tenure (Fig. 13.3).

Consider that a university wants to start the mentoring initiative above. *How does it identify suitable mentors? What are their individual skill sets? How are they trained? How is this displayed to prospective mentees?* A suggested starting place to begin a program like this is to send out a call to the faculty for interested mentors. From responses, one could examine what qualities this group brings to the table and begin to categorize these micro-credentials into groups or themes. For example, three main themes that are likely to surface are research, teaching and service. A badge system can be created that offers granular skills in each of these areas and might look like Fig. 13.3.

Faculty peer-mentors can begin the mentoring relationship one-on-one, or in small group settings, both leading to badgeable skills. A recent article in the Chronicle of Higher Education highlighted the function of the badge as a motivational tool for faculty to get involved in professional development programming; it is an easier way to communicate skills and achievements amongst a faculty community as compared to a paper certificate (Young, 2015).

4.2 *Outside Academia*

The need and use for badges outside of academia is strongly related to the Massive Open Online Courses (MOOC) movement. MOOCs provide formal training that is, in most cases, not related to a college degree. An individual (student) can take one MOOC for the purpose of learning a new required skill, improving on a current skill, or to engage in learning as a life-long learner. Many of the first MOOCs were about content such as computer languages (e.g., JavaScript), skills needed to perform or acquire jobs. For instance, Udemy provides a free MOOC that teaches JavaScript (https://www.udemy.com/draft/146326/).

Changes in the community often drive the need for new/different job skills, thus influencing the need for education on those skills. At most times, picking up a new skill or set of skills required to qualify for a job doesn't require a college degree, as in the case of certificate programs. Community education programs can provide skills like Microsoft Excel, PowerPoint, and the like, and badges could be offered upon completion, signifying to the employer that the job applicant has met the criterion to achieve that badge (NRC, 2012). As mentioned earlier, the challenge becomes deciphering exactly what a badge tells an employer about the job applicant's skills (Jovanovic & Devedzic, 2015).

5 Badging Platforms

As the University of St. Augustine pilots a badging system for faculty development, the selection of a badging platform is a crucial decision point. Readers may be most familiar with the Mozilla initiative (Mozilla.org), created by the company that really has a strong hold in the badging market, especially when it comes to badging for micro-credentials linked to education or training. However, there are several platforms that are gaining recognition; Credly came up most frequently in reference searches. The purpose of this section is to introduce four badging platforms for the *purposes of using badging for faculty development.* Various companies/platforms cater to differing audiences, the bulk of which seem to target student badging endeavors; this makes sense, as this area is where the majority of institutions and organization are focusing.

The following platforms are reviewed here: Jive, Fidelis, Credly, and Mozilla's open badges. To be discussed herein, the platforms needed to have some basic functionality: the ability to create, customize, tag (meta-data), display, and search badges and/or people. Each platform reviewed is Mozilla Open Badge compliant.

5.1 *Jive*

Jivesoftware.com

We will begin with a platform not often referred to in literature reviewed or by colleagues with whom we have had discussions, except for one pretty large exception: Ashford University. Ashford devised an area called **The Quad**, wherein professional development was tracked via badges, supported by Jive. It was used for more than faculty development: It was a collaborative space for additional uses, but the badges connected to development activities were displayed as well.

Jive has a decidedly gaming feel, so it came as a surprise to the authors that such a large university chose this provider. However, based on conversations with an Ashford representative, it was a successful pilot. Yes, this was a pilot, and the representative also noted that Ashford was moving to Office 365 as their new collaborative network platform, and, at the time (February 2015), it was unknown if badges would continue to be a part of that network.

From an educator's point of view, Jive likely would not be an obvious choice for a faculty development badging platform when considering the language used on their website, which caters more to the gamification market. However, a customized approach, using more standard terminology, could use the presentation and layout in a way that could appeal to educators.

5.2 Fidelis

Fideliseducation.com

Next in the potentially more obscure category is badging from Fidelis Education. Fidelis is branded as an education company, so at the onset, this may be more palatable to educators than Jive, as the language is what faculty and administration might be more comfortable with. We did not speak to or read about any institutions using Fidelis at the time of this writing, however.

Fidelis' badges can be "leveled," so that levels of proficiency can also be tagged to any given badge. The company offers seven levels:

1. Familiar
2. Deeply Familiar
3. Basically Qualified
4. Qualified
5. Highly Qualified
6. Proficient
7. Expert (Fidelis, n.d.).

This is an attractive option for faculty development models, especially those geared toward a rubric-like assessment framework. For the University of St. Augustine, this will be a key component for a badging system.

5.3 Credly

(credly.com)

Credly is popping up more and more in the badging for education space. The CETL at Texas Wesleyan (discussed earlier) uses Credly for their faculty development badging efforts. The University of Sussex (U.K.) chose Credly for their badging system as well, noting the following:

Credly.com was chosen because it provided badge issuers with:

- Free, easy to use badge design, creation and issuing tools.
- The ability to add criteria and evidence as metadata

Badge earners could:

- Collect badges from multiple email addresses.
- Share and embed badges across a range of online spaces.
- Organise [sic], categorise [sic], hide or display badges within Credly.
- Transfer badges to a Mozilla Backpack (Hole, 2014, pp. 3–4).

Credly has multiple partnerships for different purposes, including the New York Department of Education, EDUCAUSE, and the Smithsonian (Credly, 2015). The platform offers identity checks and "easy integration" (Credly, 2015) to other platforms. Credly's badges can be pushed, or linked, to sites such as LinkedIn and Event Brite. The range of badges and ease of use, along with partnerships and growing options, makes Credly an attractive option for many institutions interested in badging and micro-credentialing.

5.4 Mozilla Open Badges

Openbadges.org

Mozilla was really the first company to bring badges to the forefront for micro-credentialing [need to cite]. Since it is a pioneer in this market, it certainly deserves a brief review for that very fact—it has gained a substantial following, and it is still the main platform through which other badging platforms display badges, through the Mozilla "Backpack" (Mozilla Open Badges, n.d.).

According to Casilli (2012), badges can require criteria for earning a badge. Assertions are then representations of a badge. When a badge is housed within the Mozilla Backpack, it carries all the information needed to understand it as it is transferred throughout the ecosystem (Mozilla, n.d.).

> Mozilla Open Badges…require "assertions" for earning a badge. Assertions are representations of an awarded badge used to share information including how it was earned, where it was earned, who earned it, if and when it expires, etc. When a badge is housed within the Mozilla infrastructure it carries all the information needed to understand it as it is transferred throughout the ecosystem.

So, in many ways, Open Badges is a one-stop-shop for badging. It allows users to build and customize badges, tag them in many different ways, display, and publicize badges. Like Credly, Mozilla's badges can be linked to multiple other sites for display and sharing. They offer their own standards—for alignment and meta-tagging—for validation and easy searching.

In 2013, the University of Southern California published a badging platform comparison that serves as a helpful starting point. The Center for Scholarly Technology compared 11 platforms (including Credly and Mozilla Open Badges). The Product Comparison table (pp. 4–5) presents some basic, but useful, information (https://learningdesign.usc.edu/files/2013/07/TechTeamBadgesfinal.pdf).

5.5 Choosing Wisely

A few words on sustainability deserves some attention when deciding upon the best system. Since badging systems are relatively new businesses, institutions should conduct some due diligence activities. For instance, "badge forge" now links to "little bird games," which does still have a badging component, but it has changed from what the product was originally. Another note from a different system: Achievery.com has this on their landing page: "Achievery is suspending new badge creation and awarding on the platform soon. We will continue to host all current badges and associated metadata, as we seek to create a reasonable way for all of our users to access and export their badges." The authors spoke to one college that had been creating badges on a platform that no longer exists, leaving that college to take a hiatus from their badging efforts altogether. It is important to consider the longevity of the platforms to the degree possible.

Aside from creating a badging system to meet multiple needs and to be a valid measure of skills for faculty development badging efforts, the badges and display system should resonate with faculty. That may seem obvious, but in pilot discussions at University of St. Augustine, even the notion of *earning a badge*, did not sit well with some faculty. *Badge* sounded too elementary, too game-y, to some. This creates a fundamental challenge: how to gather buy-in for a system? As discussed earlier, motivation is crucial; however, something as seemingly benign as a naming convention, has the potential to derail the project before the train has left the station, or even before the train is assembled! Therefore, the badging platform will need to be attractive to faculty—likely one that caters to educators.

6 Conclusion

This chapter explored how digital badging can be applied to higher education faculty development. Badging can be used as evidence of faculty accomplishments and serve as a motivator for some faculty seeking growth and demonstrating fulfilling outcomes of activities. The use of a badging system with faculty development can be connected to rank, tenure, merit raises, and university and community service. Further, connecting badging with a peer mentoring program can be another powerful way to incorporate badging into a faculty development framework, allowing for an easy way for faculty to connect with one another, viewing available mentors' qualifications through a visual display of expertise, as identified by an institution's criteria for earning badges. A badging system should provide at-a-glance insight into the earner's experiences, and badges should validate, assemble, and promote those experiences. The experiences should align with the institution's and/or activity outcomes (Tyton Partners, 2015).

The authors also explored badging models that can be applied beyond academia and offered a review of four badging platforms that could be considered for faculty development badging. A badging system can be designed to empower and motivate faculty, through connecting university peers as well as connecting the university to the community, telling a powerful story of faculty development commitment.

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Part III
Learning and Instructional Design Considerations

Chapter 14
Toward a Comprehensive Theoretical Framework for Designing Digital Badges

Cameron Wills and Ying Xie

Abstract Digital badges, as emerging trend in education technology, present a new means of assessment in the form of granular microcredentials. The problem facing educators is that distributed learning across various domains and contexts is not captured or structured effectively. This chapter will attempt develop a framework for designing digital badge systems to help address this issue. The authors first present a range of related theories that could support the design of digital badges, including enabling learning autonomy and personalization from the self-regulated learning perspective, goal setting, and pertinent motivating factors found in digital games. The culmination of these theories is then presented as a comprehensive framework which, in turn, could possibly lay the foundation for the design and implementation of digital badge systems.

Keywords Digital badges • Theoretical framework • Self-regulated learning • Goal setting • Reward systems • Video games

1 Introduction

A major problem facing educators in distributed learning is that assessment across various domains and contexts is not captured or structured effectively. Digital badges, as emerging trend in the field, present a new type of assessment in the form of granular microcredentials with the potential to address this problem (Gamrat, Zimmerman, Dudek, & Peck, 2014). Digital badges offer flexibility to learning and assessment that would be difficult to achieve through traditional modes of assessment. They function as a statement of achievement similar to a certificate or degree but are often much more granular in their representations of accomplishment (Gamrat et al., 2014). One advantage of using digital badges is that they can represent varying degrees of mastery and specialization within a learning program

C. Wills (✉) • Y. Xie
Northern Illinois University, DeKalb, IL, USA
e-mail: cwills@niu.edu

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(Abramovich, Schunn, & Higashi, 2013). Utilizing educational badges in learning programs may also change a participant's achievement goals, as well as his/her values and expectations for success (Gamrat et al., 2014). Additionally, by allowing participants to choose their learning path, and clearly defining the conditions for success, designers provide a learning environment that is more likely to lead to motivate and engage learners (Dickey, 2005).

Despite the increasing popularity of digital badges, the field is still in need of a theoretical basis that is drawn from well-established learning and design theories. There is also a needed rationale for incorporating this tool into instructional design. The chapter aims to offer a comprehensive framework by reviewing related theories and research findings, which, in turn, could possibly lay the foundation for the design and implementation of digital badges.

2 Survey of Contributing Theories

This section will briefly review the pillared theories that could contribute to the theoretical framework; including self-regulated learning and related elements, and theories related to the motivational design of gaming. Applicable elements from relatively foundational theories, such as adult learning theories (i.e., andragogy), Cognitivism, general motivation theories, and behavioral theories are discussed in the actual model due to their similarity with the major contributing theories. These theories will be discussed in their relevance to digital badges and culminate in our theoretical framework.

2.1 Self-Regulated Learning

Self-regulated learners are active participants in learning who employ metacognitive, motivational, and behavioral self-management strategies to achieve their goals (Zimmerman & Martinez-Pons, 1990; Zimmerman & Pons, 1986). Self-regulated learning is a strong predictor of success across disciplines, academic groups, and contexts. It is further enhanced through the creation of attainable goals and subgoals in tandem with structured feedback from those goal systems (Bergamin, Werlen, Siegenthaler, & Ziska, 2012). For these reasons, self-regulated learning theory is important in understanding how to encourage student learning autonomy and ensuring academic success. In a curriculum with digital badges, learners often personalize their learning and demonstrate ownership and responsibility over the learning process. They also require a lesser degree of imposed structure. In response, the availability of digital badges is likely to help self-regulation because the inclusion of digital badges recognizes learners' desire for control and autonomy and largely supports personalization of learning goals. When a learner is working toward earning digital badges in any learning environment, he or she is very likely required to regulate his or her own learning to some degree. Therefore, perspectives from self-regulated learning will certainly help shed light on the design of digital badges and digital badge systems.

2.2 Self-Efficacy

Goal-setting behaviors largely depend on the learner's awareness of their own knowledge and skills; known as self-efficacy. Simply described, self-efficacy is regarded as a learner's perceptions of the effectiveness of their skills and abilities in a given situation (Bandura & Schunk, 1981). Self-efficacy helps learners understand what they are capable of and informs them of what they are able to achieve by measuring their performance against a standard (Bandura & Cervone, 1983; Bandura & Schunk, 1981). The importance of self-efficacy in self-regulated learning is linked to students' understanding of their current knowledge or abilities and the level of effort they need to produce to achieve success (Cheung, 2004). Students are also more likely to enact self-regulation if they understand what they are capable of in a given context and are motivated to perform. In this regard, digital badges and well-designed digital badge systems might serve to promote learners' self-efficacy by providing a standard against to judge their current skills and abilities, and providing a motivational construct to promote continued success.

2.3 Game Motivation

Motivational theories related to digital games could lend some unique perspectives to the design of digital badges, especially those related to game reward systems and learners' choices and perspectives. "The parallel between game-space design and learning-environment design reveals some of the potential that the design of popular computer and video games may hold for the field of instructional design." (Dickey, 2005, p. 72) While Moon, Jahng, and Kim (2011) demonstrate that reward systems are structured similarly to exponential learning models, Dickey (2005) states that "game design provides assistance to instructional designers not in the form of a system or a formula to be applied, but rather as a type of architectural model for promoting engaged learning" (p. 79). Game design and motivation theories were major contributors of the proposed framework because games embody many principles necessary for self-regulated learning. Feedback mechanisms in games provide an objective basis for self-efficacy that directly affects learners' ability to self-regulate their learning. Good games scaffold goals and allow for player freedom to choose and engage with those goals on their own volition. Good games also require players to self-manage their time, efforts, and attention and to reflect on their play to optimize their performance. These features and properties provided important insights to the development of the proposed theoretical model.

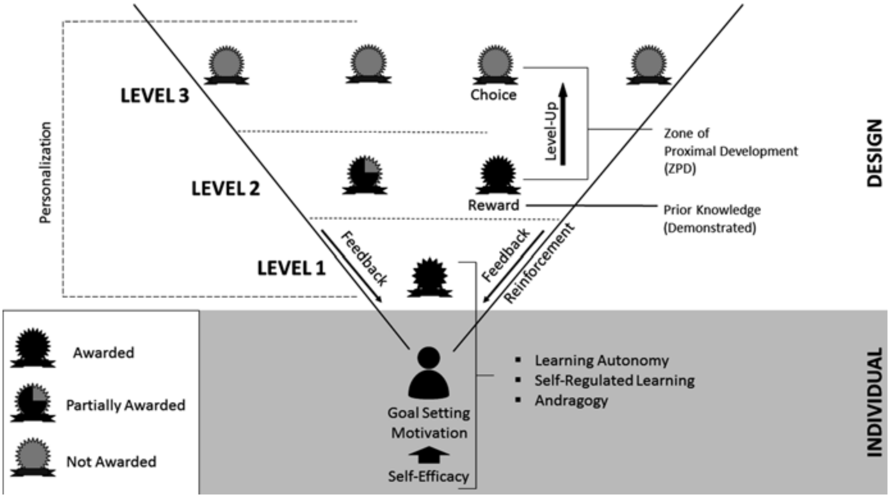

Fig. 14.1 Proposed theoretical framework for digital badge design

3 The Proposed Theoretical Model

Based on the pertinent theories above, a theoretical model is created to offer particular perspectives for digital badge system design. Figure 14.1 shows the model.

The framework consists of two major levels: *individual* and *design*. The individual level depicts the cognitive, psychological, and emotional processes that could affect a learner during his or her goal-setting and badge-pursuing activity. The design level describes the environmental factors to be considered when designing a training curriculum with digital badges. In the section below, we will further discuss each level, their respective elements, and the interaction between the two levels in detail.

3.1 Individual Level

3.1.1 Learning Autonomy, Self-Regulated Learning, and Andragogy

According to Knowles' principles of Andragogy (1984), adults should be the agent to plan and evaluate their instruction. If the learning subjects are of immediate application to their profession or life, they will be more interested and motivated in the learning tasks. As a result, one orientates his or her learning goals based on their needs and motivation. The core ideas of Andragogy are strikingly similar to the concept of learning autonomy in self-regulated learning theory.

Self-regulated learners initiate and direct their efforts in attaining knowledge and developing skills. According to Paris and Paris (2001), a core concept in self-regulated learning is learner autonomy and control through which the individual, being cognizant of his/her strengths and weaknesses, directs their own actions, adjusts learning goals, and expands expertise toward self-improvement. That is, the learner's freedom and sense of control over their learning is required for self-regulated learning.

3.1.2 Self-Efficacy

Self-efficacy is the measure in which learners believe in their ability complete tasks and goals. This informs the learner's personal goal setting strategies and is fed by feedback from the learning program with which they are engaged. In the proposed framework, self-efficacy is informed by feedback from the learner's engagement with the badge system, and acts as an affective component in their ability to self-regulate their learning. The feedback from the digital badge system includes goal completion, future goals, goal progress, and overall program standing. This information provides learners with essential information to inform their beliefs about their abilities based on their accomplishments. A learner's self-efficacy would also affect their goal setting behavior and planned engagements with the digital badge system.

3.1.3 Goal Setting

According to Maslow's hierarchy of needs (1943), an individual has innate growth need once the basic needs are satisfied including physiological needs, safety, belongingness and esteem. Self-actualization, as a major need for growth, is characterized as a concern about personal growth. In the pursuit of professional growth and personal competence, one looks for opportunities and sets up academic and nonacademic goals for further development. One's motivation, both intrinsic and extrinsic, affects the individual's commitment to the goal (Malone & Lepper, 1987). Commitment to academic goals relies heavily on the influence of self-efficacy both toward academic achievement and for self-regulated learning, as well as personal goal setting (Zimmerman, Bandura, & Martinez-Pons, 1992). Ones' commitment to goals could be partially described as self-motivation (Bandura & Schunk, 1981). Students' perceived intrinsic value of learning materials acts as a predictor of student motivation to employ cognitive strategies and engage in self-regulated learning (Pintrich & De Groot, 1990). The object of the digital badge system is to foster self-regulated learning through the scaffolding of skills and presence of learner autonomy within the system. In such a system, once learning objectives for a subgoal are met learners are rewarded with a badge recognizes their new skill, ability, or achievement.

The concept of reward is rooted in behaviorists' theories (e.g., Skinner, 1938; Thorndike, 1905). These theories dictate that reinforcements and punishments as consequences to a behavior can influence the association between a stimulus and a behavior. Similarly, Knowles (1984) also recognized the role of one's prior experiences including failure and mistakes in one's goal setting behavior.

Principles derived from behaviorism also cautioned us that stimuli with consequences should be properly arranged in the learning environment. In the case of digital badges, it is important to note that this type of recognition should not be rewarded for mere progression through a program (e.g., "Completed Unit 2"), but specifically mark a skill, ability, or achievement that is meaningful and specific (e.g., "Get Published," "Web Developer-Level 1"). There should be an obvious gain in skill or ability that the badge represents, not replaces. In addition, new competencies should build on, advance, or relate to previous achievements (e.g., "Web Developer-Level 2," "Conference Presenter"). In short, digital badges serve as a certifiable indication of competency and goal completion. Learners will be motivated to gain recognition through learning and demonstrating ability embodied in a badge.

3.2 Design Level

3.2.1 Goal Scaffolding (Within the Zone of Proximal Development)

In the proposed framework, individual badges represent subgoals that should be structured so foundational knowledge and/or skills are achieved before progressing to more advanced subgoals, and build on or utilize earlier competencies. This design consideration is consistent with cognitivists' theories that stress the role of prior knowledge and specifically offered guidelines about the chunking and sequencing of new information to promote understanding. Learning occurs when new knowledge is connected to prior knowledge through mental processes in a meaningful way (Gagné, 1985). Subgoals should also be categorized based on the level of skill required to complete (e.g. entry level, intermediate, advanced, etc.). Distal goals are broken down into proximal subgoals, and are ordered from entry-level skills or competencies to the more the complex as a learner progresses through the digital badge system. Distal goals mark a general domain competency that are achieved through the demonstrated abilities of the learner. Distal goals should represent the culmination of knowledge and skills built from the acquired sub-goal achievements. Finally, subgoals need to have clear criteria for their accomplishment including demonstrated skill through documentation or artifacts.

Using a progressive, scaffolded subgoal system provides enough structure for learners to choose the proximal subgoals that they want to focus on without leaving them completely to their own devices. Ordering progressive skill learning in this way gives learners both choice and structure which will ideally lead to increased autonomy and self-direction.

3.2.2 Level-Up Feature

The proposed *level up* feature in digital badge systems shares in Vygotsky's idea of the zone of proximal development (ZPD). The zone of proximal development characterizes mental development *prospectively*, in contrast to actual development which characterizes the development *retrospectively* (Vygotsky, 1978). For the purpose of digital badges, recognizing learners' actual skills through badging, and providing a framework of prospective competencies (i.e., existing in the ZPD), would be advantageous to the development of self-regulated learning behaviors. The level up feature builds on this idea by positioning entry-level goals (e.g., badges) early in the system (e.g., level one), and progressively building on those early competencies to "unlock" higher-order skills and competencies. The level up area acts as a resting point after the completion of a goal in which learners can reflect on their accomplishments and determine a new goal direction. The level-up design also makes the feedback or consequence explicit to learners so that they can adjust their goals accordingly. In the proposed framework, a level can be unlocked through the completion of some or all of the skills of a lower level depending on the nature of the learning program. This is consistent with the cognitive view that prior knowledge must be mastered for further learning to take place.

3.2.3 Choice and Perspective

Dickey (2005) reveals that providing participants with choices in learning and achievement might sustain interest and engagement over time. Dickey (2005) is aligned with Moon et al.'s (2011) assertion that "level up" areas are helpful in grounding participants in their learning environment by serving as a break from the "action" which they receive important information (p. 74). Also, Dickey (2005) suggests that a perspective shift between bird's eye and first-person changes the type of experience, engagement, and strategy of a player from planning to encountering, respectively. This is important to note because it informs how instructional designers should approach the design of their badging environments. Namely, that first person perspectives are much more reactionary and immediate, and the bird's-eye perspectives are more contemplative and strategic. Both of these perspectives have merit and application. The first-person perspective, for example, can be compared to *participating* in a workshop or seminar, while the bird's-eye perspective can represent *planning* to attend a block of workshops or a particular seminar series. The bird's eye perspective also poses an opportunity for digital badge systems to identify and focus learning objectives, and to order them intelligently.

Common and important mechanisms in traditional games are clearly defined victory and loss conditions; with rules that are consistent with both the game and the character (Dickey, 2005). The object of all games is to achieve success through the mastery of the game's objectives. The implication for instructional design is that success, or achievement is attained by conditions that must be satisfied according to a well-defined methodology (i.e., rules) that is consistent with both the learning objectives and the purposes of the participant within the program. For example, a nurse who is being trained on a new method of obtaining blood from a patient has a set success condition (obtaining the blood sample) that she must complete according to the new method. The rule is that she must follow the new methodology in order to achieve her objective. Any deviation from the rule (or rules) marks a failure condition. This example provides a clear learning objective and clarifies the purpose of the participant in the program. The combination of various victory and loss conditions can make up a program that requires compounded achievement. However, it is important that those conditions are consistent with the purpose of the program's learning objectives and the purpose of the participant within the program.

Dickey (2005) suggests that structuring learning programs with conditions that are consistent to the purpose of both the learner and the learning objectives also allows instructional designers to create a narrative for participants. This narrative situates participants within a learning context within which they have the freedom to pursue learning paths and gain recognition for their success. Game design provides an architecture that can inform motivating, intuitive, and effective learning environments but, there is a need to study narratives which hold interest over time in complex, multifaceted learning environments (Dickey, 2005).

The power of digital badges is in the customization of the system to meet learner needs and promoting their ability to self-regulate. Therefore, choice is central to the design of the proposed framework. The introduction of choice shifts the locus of control back to the learner to where they determine the importance, order, and timing of their learning goals. Instances of choice in the proposed framework occur at the start of the program (level 1) and at the completion of each goal (badge).

3.2.4 Personalization

Personalization is important in learning programs because of the motivational benefits participants receive (Gamrat et al., 2014). Similarly, according to Malone and Lepper (1987), the ability to control is one factor in promoting intrinsic motivation. Flexible programs in which participants can choose their learning paths and level of involvement allows them to customize their experience based on their personal needs, expertise, and the demands of their affiliate organizations. Similarly, in programs such as scouting, a display of a participants earned badges "represents a type of curriculum vitae of their learning and allows other to learn both about what a scout knows and what the scout values" (Abramovich et al., 2013, p. 219). The issuers of educational badges, whether an educator or educational organization, recognize skill, knowledge, or achievement through badges much in same way in which they award degrees or certificates; yet the recognition is much more particular. A badge display gives outsiders a more granular understanding of the learners' competencies and values compared to more traditional achievement objects such as certificates or titles. In this way, badge displays reveal the uniqueness of the learner's skill set and expertise.

Gamrat et al. (2014) explored the use of a digital badge system and in a self-regulated online environment to study how online professional development interactions and design should be supported. Their program, Teacher Learning Journeys (TLJ), was piloted as an approach to professional development that allowed participants to “customize their experience based on their workplace needs, as well as on their own expertise and interests” (p. 1). The researchers utilized a badge system with the TLJ program to mark achievement. The metadata for these badges included the following: “(1) a description of the tasks required by each PD activity, (2) the evidence of the learner’s mastery, and (3) feedback provided by the expert practitioner.” (p. 6). The program also provided participants with an online self-assessment tool and required them to set initial goals at the start of the program.

The researchers found that most participants chose learning paths that were sensitive to the needs and goals of their workplace, and customized their content selection based on their own particular needs. Participants also “customized the level of assessment and the specific content depth to personalize the PD training for workplace constraints” (p. 1). By planning their objectives from the beginning, participants were more prepared to articulate and assess their own needs. It is interesting to note, however, there was one participant in the study who did not start goal setting until after participating in a few sessions using TLJ. Yet, this individual still reported a benefit from using the system. In this instance, the flexibility of participants to conduct initial and emergent goal setting helped support their needs and develop expertise. The advantage of the digital badging system for the participants in this study was that it provided visual reminders of accomplishments as well as feedback and direction for their continued development using the TLJ system. Using the digital badge system as a way to personalize learning experiences proved beneficial to all learners involved in the study. While some participants needed an in-depth understanding and mastery of a concept or skill, others only needed superficial understanding or exposure to fulfill their personal or organizational needs. Allowing this form of flexibility and the inclusions of an assessment system, which provided appropriate credits for the level of competency or skills attained by participants, is important for program designers to consider when creating learning environments using digital badges.

3.2.5 Feedback

Feedback (or consequences in Behaviorism), in essence, can serve as a reward for a learner’s effort. Reward systems in games use extrinsic motivators as a way of recognition for displaying certain behaviors, skills, or a complex demonstration of both (Malone & Lepper, 1987), Often performance and excellence are rewarded with new items, titles, or player status (e.g., leaderboard advancement). These rewards may not only benefit the player in the game and serve as a social status symbol to peers, but also embody real demonstrations of skills and competencies—and may be desired explicitly for that purpose (Dickey, 2005). Digital badges could be considered a form of reward for accomplishment within learning programs to boost one’s confidence level according to Keller’s ARCS model (1987). Therefore, research on reward systems might provide useful insight into how to design a digital badge reward system within a learning environment. Moon et al. (2011) lend credibility to the use of game reward systems in learning programs in order to promote self-regulated learning. Their research finds that "the reward system (in digital games) is designed similar to an exponential learning model" (p. 1) and that these systems are designed in slightly different ways depending on the game's genre and their intended audience. Moon et al. (2011) also state that "[a] similar framework to the [sic] self-regulated learning (SRL) constantly emphasized by educators in the field is actually occurring naturally during digital gameplay" (p. 12). Because of the appeal of flow induction mechanisms present in these games, there have been many attempts to reconstruct it in learning model design. The authors' research examines the reward system of digital games and investigate the possibility of using similar reward systems in learning model applications. In their study, they examine both education-oriented video games and entertainment-oriented video games to find models that could be applied to learning programs. They collected data from new and experienced players and collected experience point (EXP) data from the game production companies in both categories, analyzed the level-up systems in each, and compared the data with an exponential learning model.

The researchers conclude that "if the powerful level-up area does not function distinctively or if irregular events happen without any relation to education it would be difficult to accomplish the primary goal of learning with this system." (p. 11) The "level up" area that Moon et al. (2011) describe also serves to situate learning and promote cognitive apprenticeship for participants, and could signify an appropriate application of a digital badge system. By situating the learning material, such programs allow for greater creativity and personal application (Gamrat et al., 2014). These new skills, and the recognition of such skills, provide a form of entertainment through the reward structure that parallels the achievement of success within a game context. It is as if to say "I've learned/mastered a new skill that I can use to progress even further on my journey," and to have this achievement represented in a respected icon (e.g., a sanctioned badge). Reward systems must reflect the values of both the participant and the program in which they are engaged (Gamrat et al., 2014). Ideally, a program modeled on the reward system in entertainment-oriented digital games in learning environments would create a context where growth was perpetually motivational and predictably rewarding. The appeal here is that participants would persist in programs that further their knowledge and ability.

Goal systems and feedback mechanisms have shown to increase subjects' performance and motivation resulting in greater gains in achievement (Bandura & Cervone, 1983). Students' self-efficacy perceptions are important here, as those who feel able to reach their goals but are unsatisfied with their performance are motivated to make greater gains. This effect dissipates if the discrepancy between perceptions of self-efficacy and performance feedback are too great (Bandura & Cervone, 1983) or if the goals are too general (Bandura & Schunk, 1981). Simply stating that one's goal is to be better at math for instance does not allow for the informative feedback necessary for motivation because of its expanded meaning—resulting in abstracted feedback. Therefore, it is important that distal goals are structured into specific and attainable subgoals in order to be effectively motivating in self-regulation (Bandura & Schunk, 1981). By combining goals and performance feedback, subjects display higher gains in both performance and effort (Bandura & Schunk, 1981) and knowledge of their perceived skills and abilities are benefited by goal systems—helping them to better self-regulate (Cheung, 2004).

3.3 Design Summary

In summary, in a learning environment utilizing digital badges, learners must exercise their own learning autonomy by setting up learning goals based on their belief about their own knowledge and abilities. Beyond the individual level, the training program should not only provide level-up goals and subgoals, but also allow personalization of one's learning paths. In this way, within their zone of proximal development learners could possibly make choices appropriate for their own chosen paths. Digital badges as reward mechanisms offer feedback to the learners so that they can further adjust their choices toward achieving new goals.

4 Conclusions

This chapter has attempted to provide contributions toward a comprehensive theoretical framework to address the design and application of digital badges. Digital badges are unique in solving the problem of recognizing achievement across distributed learning programs in both formal and informal contexts. They provide educators and instructional designers a new assessment in the form of granular microcredentials that offer flexibility for both learning and assessment. Well-designed digital badge systems might also encourage self-regulated learning behaviors in learners by acting as both a goal setting system and feedback mechanism which situates learner experience and provides them with a significant degree of learning autonomy. However, there are considerable administrative and technological concerns that would prevent such a system from being put into effective use. Notably, in order to benefit as described, adoptive learning programs would by nature need to be heterogeneous and individualized. This is in stark contrast to the homogenized nature of conventional learning programs where often all learners typically focus on the same particular goals set at rigidly defined points in time. While these programs should not necessarily be discouraged from adopting digital badges as a form of alternative assessment, it is the authors' belief that digital badge systems work best when learner autonomy is central to the design of both the badge system and the learning program. This will be an administrative challenge that should be addressed in advanced. Additionally, the technological nature of both digital badges and of autonomous learning may be a challenge for learners in contexts where the implementation of either might be a significant challenge to overcome before the adoption of a digital badge system.

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Chapter 15
Digital Badges and Micro-credentials: Digital Age Classroom Practices, Design Strategies, and Issues

Barbara Fedock, Mansureh Kebritchi, Rebecca Sanders, and Alicia Holland

Abstract Digital Badges and Micro-credentials are documents that demonstrate individuals are engaged and productive members of a community. Additionally, earning Digital Badges and Micro-credentials may play a significant role in how individual earners increase self-achievement or view perceptions of self. Digital Badges and Micro-credentials show that earners have successfully attained set of goals. Earners have an opportunity to include Digital Badges on their resumes or to personally use Digital Badges to keep a running record of individual accomplishments through the accumulation of badges or credentials, similar to collecting Boy Scout badges. Digital badges or Micro-credentials afford opportunities for the use of alternative assessments which are designed to focus on extrinsic or intrinsic motivational strategies that promote individual or group earner success and learning outcomes. Earners engage in competency based, game based, or hierarchical learning that appeal to different learning styles and meet the needs of diverse learners. Digital Badges and Micro-credentials are valuable documentation for recognition of educational accomplishments or workplace efficiency. MIT, Yale, Purdue, Carnegie Mellon, and organizations such as Smithsonian, Disney-Pixar, and NASA use badges for honoring and commending learners or employees improved skills, knowledge, and accomplishments in education and in workplace development. To increase the use of Digital Badges in organizations, adoption factors based on theory of Diffusion of Innovation should be addressed. Individuals and the community can view earners' successes, accomplishments, and productivity through displays of Digital Badges and Micro-credentials.

Keywords Digital badges • Micro-credentials • Instructional design • Motivation • Alternative assessment

B. Fedock (✉) • M. Kebritchi • R. Sanders • A. Holland
University of Phoenix Faculty, Asheville, NC, USA
e-mail: bfedock@juno.com

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1 Introduction

Digital Badges or Micro-credentials provide authentic evidence that individuals are engaged members of a community. Other members of the community have a window through which to view accomplishments and worth of individual Digital Badges or Micro-credential earners. In culturally diverse communities, specific cultural and age appropriate needs for recognition and personalization are met. Digital Badges or Micro-credentials can be transferred to the workplace, and employees can potentially be acknowledged for achievement and productivity (Mozilla Foundation, 2011).

2 Appropriate Instructional Strategies

Digital badges are used to show that individuals have achieved a certain milestone and are considered to be alternative assessments to measure student progress. One appropriate instructional strategy that should be considered when using digital badges is problem based learning. Problem Based Learning (PBL) is a strategy that is used in teaching to ensure that learning activities are developed around a real-world problem (Echeverri & Sadler, 2011). When students are able to construct their own meaning to a problem, then that is where the real learning occurs because students are forced to use both their critical and creative thinking skills to come up with solutions to solve the problem. PBL supports the Constructivist Theory students are able to construct their own meaning to a real-world problem. As a result, this type of learning environment should be designed where students are able to use both their preferred learning styles and multiple intelligences to construct and apply their knowledge to the situation or content presented to them.

Digital badges would work best in multimodal learning environments that are designed for learners to experience complex, realistic, and authentic problem solving environments that may be deemed either synchronous or asynchronous learning environment (Whittington, 2010). Multimodal learning environments afford instructional designers to design learning activities and assessments that cater to students' diverse learning needs and help capture a better idea of what a student has mastered.

3 Alternative Assessment

Arne Duncan, US Secretary of Education, identified badges as documentation that measures personalized competency for formal and informal learning, which provide credentials for learners (US Department of Education, 2011). In 2011, Secretary Duncan announced a competition centered on digital media projects supported by the MacArthur Foundation. During his speech, Secretary Duncan states the learning is a “process that is not only lifelong, but life-wide” (US Department of Education, 2011, para. 12). This competition initiated the quest for using digital badges to acknowledge that life-wide learning necessary for recognizing the learning experiences an individual receives outside of the formal learning environments of schools and colleges. Many people learn new skills on the job or from other experiences such as the military or volunteer work. These new skills are not part of the formal transcript or resume, and may be overlooked. Digital badges can help overcome this gap in recognized learning for an individual; therefore, the Badges for Heroes Challenge was launched. The Veterans Affairs and the Department of Education supported the competition with an award of $25,000 (MacArthur Foundation, 2011, para. 3).

Digital badges are capable of producing a visualized record of achievement for an individual’s skills, accomplishments, and knowledge (Sullivan, 2013). The movement for digital badges stemmed from a collaboration between the MacArthur Foundation and the Bill and Melinda Gates Foundation to produce the Open Badge Project in 2011 (Sullivan, 2013). The purpose of the project was to “develop an infrastructure for creating, issuing, maintaining, and sharing badges across multiple technology platforms, educational environments, learners, and other interested parties” (e.g. employers) (Sullivan, 2013, 77). U.S. Secretary of Education, Arne Duncan, stated that badges provide a promising method to assess skills and abilities that an individual has gained from any learning environment. Badges would produce a change in credentialing individuals, which would empower the individual to build a reputation, or brand, for their learning mastered. Several advantages can come from this change. First; individuals are more actively engaged in their learning. Second, individuals can demonstrate a more eclectic portfolio of their capabilities. Third, individuals can now record life experiences, such as serving in the U.S. military or volunteer work. And fourth, individuals may be more prone to continue lifelong learning adventures.

4 Educational and Corporate Context

The MacArthur Foundation and the Gates Foundation partnered with company Mozilla to support the Badges for Lifelong Learning Competition. One organization, Humanities, Arts, Science and Technology Alliance and Collaboratory (HASTAC) stepped in as the administrator for the competition; specifically, the HASTAC teams from Duke University and the University of California. Mozilla operates on ten principles centered on enrichment, collaboration, accessibility, innovation, openness and individuality. The open community concept conceived in 1998 became available to the public in 2002. Within 2 years, Firefox (originally known as Mozilla) became a popular tool for browsing the Internet. Mozilla’s contribution to digital badges is a website known as Open Badges. Open Badges allows an individual to collect and store badges that recognize skills or learning represented by a badge displayed on the learner's website.

Purdue University partnered with the Open Badges project to take this challenge of creating another level of empowerment to student achievements. Purdue University incorporates a digital badge program called Passport. A student will create a Passport Profile where they can display their badges. Instructors can create the badge to focus on a competency, skill or learned performance while students can earn the badge to display on their profile. A student can also show the information concerning the achievement of the badge. Students can also embed the badge on a social media site. The system is open to all faculty who want to provide badges for their students; it is available for any faculty, not only Purdue University faculty. Dr. Watson, faculty member who oversees the project, reports that some workforce is using Passport for professional development; however, his program is a master's program. The program, supported by the Dean, wants to further the badge program across the other Master's courses. Dr. Watson noted that competency was one aspect where problems arose. "What are the competencies? How are they reflected in courses? Are all competencies actually addressed somewhere in a course?" (personal interview, 2015, June 2). One method used with Passport is to identify necessary competencies and how it aligns with the skill taught in the course. Dr. Watson noted that this was a great method to identify downfalls within a training program, too. Currently, Passport has no current standard; this is something that needs to be set.

One future goal for Passport is to make the system available across all disciplines and include the undergraduate programs. Instructor buy-in has been a "push and pull effort. They want it if it has a good impact; not if it's a wasted course" (personal interview, 2015, June 2). Students can request additional badges earned based on their experience, too. The student makes a submission request, which undergoes a quality check review by a committee member. The quality check includes a peer-review against a rubric. If the review appears to meet the rubric guidelines, the request is then sent to a faculty member for further review. The initial peer-review saves faculty from reviewing requests that do not meet initial guidelines.

The Institute for Performance Improvement offers badges within Instructional Design in place of a formal Certification. The badges are earned based on the individual's ability to perform the skill based on a review of at least two experts against their standardized rubric. Once the badge has been purchased and earned, individuals can add the certification acronym to their title and use the badge on their social media, website, or blog. The badge is linked to a verification website where others can learn about the certification requirements (The Institute for Performance Improvement, n.d.).

The sustainable-agriculture program at UC-Davis was one of the winners of the competition. Initially, the college conducted a survey to identify the important concepts, which resulted in systems thinking, strategic, management, and interpersonal communication. Students earn badges from both the courses they take and their lived experiences. "Students won't just earn badges—they'll build them, in an act of continuous learning" (Carey, 2012, para. 8). For example, a student working on a farm could request a badge to show a specific skill, such as integrated pest management, on his portfolio. Potential employees can review the badge to see the actual skill completed to earn the badge. According to Carey, badges make the transcript system see archaic. Psych 101 at one college may not contain the same skills or knowledge as Psych 101 at another college. In contrast, the badge system creates the opportunity to detail the concepts learned to achieve the badge.

5 Diverse Learners and Cultural Diversity

Cultural diversity includes a wide range of areas in which groups and individuals form identifies. Though demographics and culture play key roles in how cultural diversity is perceived, cultural diversity can be viewed on a personal level. Personal diversity is how individuals perceive other people view them, as well as how individuals view self-efficacy. Digital Badges and Micro-credentials play an important role in how individuals cultivate self-achievement and evaluate self. Digital badges display achievement levels that are significant to the bearer of Micro-credentials and badges (Fontichiaro & Elkordy, 2013).

Digital Badges and Micro-credentials meet the needs of an extended range of users. All ages may benefit from earning digital badges. If open badges are awarded, the badges can be kept as a memento of good work or accomplishment. Parents or care givers can see progression of a child's endeavors and utilize badges as an incentive to promote expected behaviors or to reinforce learning and skill developments. Culturally diverse children who achieve digital badges or micro-credentials are rewarded both extrinsically and intrinsically. Digital Badges or Micro-credentials can be used to enhance individual self-worth and impact how groups view culturally diverse learners (Abramovich, Schunn, & Higashi, 2013).

Digital Badges and Micro-credentials meet the needs of diverse age learners. Educational organizations may make Digital Badges and Micro-credentials available to use as assessment or motivational tools in the classroom (North Carolina Department of Public Instruction, 2015). A variety of computer programmers include Digital Badges or Micro-credentials in gaming or simulations. In some programs, participants are able to process to different levels of Digital Badges. After recognizing the impact of Digital Badges or Micro-credentials in gaming, business community leaders investigated the impact of accepting Digital Badges or Micro-credentials in the workplace (Ahna, Pellicone, & Bulter, 2014).

When Digital Badges or Micro-credentials are publishable and endorsed by the issuer, employers may find a larger group from which to select qualified employees for technical positions that required a select set of skills. Global business leaders need a wide range of employees with a diversity of skills; however, often the skills do not require 4 years of college or technical education. Individuals may engage in workshops or programs that equip and qualify them to work in specific technical areas. When badge designers establish well defined guidelines for awarding badges, employers recognize and honor standards that each badge symbolizes. The standardization of badges is a time saving and cost effective recruiting and hiring tool for employers who need to hire persons with expertise in specialized fields (Janzow, 2014-2015).

Barry Joseph is the Director of the Online Leadership Program, which is run by Global Kids, Inc. According to Joseph, both high achievers and low achievers were motivated with the use of badges. This observation was a result of the "Urban by Diversity Network/Ecoliteracy project at the Museum of Natural History. This project encouraged youth to use mobile phones to explore the community around the museum" (HASTAC Team, 2011).

From Purdue University, Dr. Watson also responded to the following questions: "What was the most difficult issue you found in the project?" "What words of advice he would give?"

There are a variety of challenges to badge work. The most constant is going to be the load it can put on the person assessing the work. A big challenge as an instructional designer is figuring out how to create very specific and measurable learning outcomes that the badge is targeting. Most instructors use fairly broad learning objectives in their syllabi, and badges require a much more defined and specific focus. Perhaps the largest challenge is simply trying to utilize new paradigm approaches and technology in the current system of education. Badges are supposed to free us from the time-driven nature of our current system, but you still face those constraints. So, it can be difficult to support learner-mastery approaches when the semester has its deadlines, and they are not flexible. (Watson, email communication, 2015, June 16)

Laura Fleming works as a school library media specialist in New Jersey. Fleming developed a website, Worlds of Learning, where educators can earn and display badges. While Fleming's efforts are for educators at her school, other educators have registered with the website. Fleming's desire is that educators will consider using badges in their instructional strategy (Barack, 2013)

Sophia Learning, LLC offers badges online. Initially, the website offered Flipped Classroom Certification and a badge. It currently has three other certifications.

- iPad Prepared Certification
- Chrome Classroom Certification
- Virtual Classroom Certification (Sophia Learning, 2015)

6 Adoption Factors

For adopting any innovation, contributing factors should be identified. Digital badges have great potential benefits to be used in educational as well as corporate settings. Many higher education institutions such as MIT, Yale, Purdue, Carnegie Mellon, and organizations such as Smithsonian, Disney-Pixar, and NASA are using badges for recognizing learners or employees improved skills, knowledge, and accomplishments out of course setting and in professional developments (Stebbins, 2013). However, some resistances and uncertainties still remain about effectiveness and adoption of badges (Riconscente, Kamarainen, & Honey, 2013). Particularly credibility of digital badges was reported as one of the major barriers for adoption of digital badges (Davis & Singh, 2015).

To address such uncertainties and resistances, adoption contributing factors based on Rogers' (2003) theory of Diffusion of Innovation is suggested. Diffusion is referred to as a process through which a new idea, practice, or tool, called an innovation, is communicated over time with members of a social system. The aspects that determine the rate of spread and adoption of an innovation include: Relative advantage, compatibility, complexity, trialability, and observability to those within the social system. According to diffusion of innovation theory, relative advantage is referred to the degree to which an innovation is perceived as better than the idea it supersedes. The perceptions are more influential than objective advantages of digital badges. Therefore, institutions should further focus on explaining the benefits of digital badges to accelerate adoption of badges. Compatibility is referred to the degree that the innovation is perceived as being consistence with existing practices, tools, and need of potential users. Digital badges should be consistence with the prior evaluating method within the system to be adopted faster. Complexity is referred to the degree to which an innovation is perceived as being difficult to use. Digital badges should use a relative simple and understandable technique to speed up their adoption. Trialbility is referred to the degree that an innovation is being tested and experimented for the limited time by the users. Badges may be introduced to organization in installment plan to speed up their adoption. Finally, observability is the degree that an innovation is visible to the other users. The more individuals see the application of digital badges, the more likely they adopt badges. The practical implication is to first piloting use of badges in an organization then reporting the effect of using badges so that everyone observe its effectiveness and better adopt digital badges.

7 Technical Issues Related to Digital Badges and Micro Credentials

Discussions on the reliability and validity of digital badges and micro credentials technical issues include questions that focus on who will present and monitor the awarding of academic and degree certifications as digital badges and micro credentials. In the past, digital badges and micro credentials were mainly associated with scouting and playing games. Badge holders seldom received workplace advancement or degree certifications from being awarded badges or digital micro credentials (Baker, 2011).

Badges awarded to scouts were physical symbols that demonstrated scouts had met well established goals. Game participants earned virtual badges or micro credentials that possessed limited value. The digital badges and micro credentials served as tokens of levels of play or score points made. Scout organization leaders and game designers constructed well defined constructs for success, and, due to the nature of the badges, questions were seldom asked concerning who established criteria for issuing awards (Sullivan, 2013).

The roles of awarding digital badges and micro credential values have changed. As schools, professional organizations, and businesses recognize digital badges and micro credentials as authentic documentation for learning and skills advancement, questions about the validity of sources for issuing badges and credentials arise. One key question is *What organization or overseers will set valid standards for the awarding of digital badges and micro credentials?* Another question is *How will the process for the implementation of standards be organized and be systemically reviewed*? and *What group will enforce the standards?* (Bumphus, 2014).

Dependable Internet systems were created and designed by technical digital experts to ensure the trust worthiness and monitoring of the awarding of digital badges and micro credentials. However, the quest to set and maintain higher standards is ongoing. Internet companies such as the Mozilla Foundation continue to refine and clarify standard settings and create monitoring systems that are valid and reliable. However, as more and more professional organizations adopt the concept digital badges and micro credentials, rigorous and reliable measures will be put into place to guarantee validity (Mozilla Foundation, 2011).

Questions which stem from technical issues involve how to make digital badges and micro credentials more portable. Open digital badges and micro credentials are one way to ensure that earners can transfer awards and save them over a long period of time. Academic, community related, or work related digital badges and micro credentials demonstrate a level of accomplishment that may affect career or personal gains, earners may want to retain portfolios of badges or micro credentials to transport to resumes or to display publically (Ahna et al., 2014).

Though academic, community, or work related digital badges or micro credentials demonstrate a level of achievement, badge or credential viewers may hesitate to accept the digital documents without knowing the rigor or depth of the task that was performed to earn a digital badge or micro credential. Without well established and published standards for awarding digital badge and micro credential by organizations, viewers may make invalid judgments about the values of awards (Young, 2012).

Similarly, the credentials of the organization or person bestowing digital badges and micro credentials continue to be challenging issues. Viewers of digital badges and micro credentials may question the merits of digital badges or micro issuers' credentials. Questions may be asked about the rationale or level of professionalism for issuing the digital badge or micro credentials. If a professional and valid system to check credibility of sources is not in place and easily accessible, viewers may reject the worthiness of digital badges and micro credentials (Halavais, 2012).

Recognized and well respected academic and global organizations accept digital badges and micro credentials. Though the standards for awarding badges and credentials are not yet standardized, business and education communities honor a wide range of digital awards. To promote the acceptance of digits credentialing, the Mozilla Foundation and other Internet organizations are engaged in creating valid safeguards and global standards for earning digital badges and micro credentials in the ever changing digital landscape (Mozilla Foundation, 2011).

Digital badges and micro credentials signal a recent change in the world of education. Rather than award grades for high stake assessments, individuals earn digital credentialing. Diplomas may be replaced by a collection of digital badges or micro credentials that provide certification for a variety of contents rather than a diploma in a broad area. Though the content of what was learned in each area and how the content was presented varies from institution to institution, organizations set standards for task completions. The end result is the accomplishment for meeting a specific set of tasks is understood to be criteria judged worthy of an earned digital badge or micro credential (Ferdig & Pytash, 2014).

Digital badges and micro credentials are being instituted in educational establishments, community organizations, and in the global marketplace. Though questions exist about technical issues, Internet organizations are working on setting standards for digital badges and micro credentials that promote validity and reliability. Technical standards for digital badges and micro credentials are evolving, and Internet programs designers will create a set of standards that will ensure a high level of credibility (Young, 2012).

8 Motivating Digital Badges and Micro-credentials Earners: Intrinsic Verses Extrinsic Motivation

Digital badges and micro-credentials are alternatives for earning degrees and grades and for incentivizing people who are extrinsically and intrinsically motivated. Extrinsically motivated people may only be motivated by fear of punishment or the appearance of earning a reward. On the other hand, intrinsically motivated people are internally inspired to gain acceptance or earn recognition. Digital badges and micro-credentials provide motivation for both types of individuals (Mozilla Foundation, 2011).

Student grades may fluctuate and be unpredictable predictors of achievement levels. Intrinsically motivated students' learning styles may not be met in the classroom when grades are the primary achievement indicators. Students who are internally motivated may not find a test driven learning environment to be a safe and caring setting in which they are personally motivated to be engaged or receptive to new information. During the digital badge or micro-credentials process, intrinsically motivated engagers may work on a level that is more pleasurable and rewarding than task driven. Digital badges and micro-credential intrinsic learners are inspired by the opportunity to be recognized for personal achievement (Glover, 2013).

External learners may lack the internal motivation to learn new information for the sake of pleasure. These learners must make a clear connection between the completion of a task and how the individuals will be rewarded or punished for completing or not completing a task. However, a well established set of perfunctory measures help extrinsically motivated learners perform to meet established standards without retaining or transferring knowledge. Digital badges and micro-credential earners motivate extrinsic learners to set specific levels of achievement based on knowledge or criteria set for accomplishing goals, such as in gaming (Carey, 2012).

Digital badges and micro-credentials increase student learning outcomes. Intrinsically motivated students are influenced by the need for internal satisfaction, and they may scaffold successes to meet goals they want to attain. Learning is personal, and students feel internal pleasure when rewards are earned. Whereas, externally motivated students are stimulated to achieve goals to avoid punishment. The engagement activity may not be considered fun or enjoyable. Intrinsic learners enjoy participating in activities and find them fun. Earning a digital badge or micro-credential is part of the enjoyment. The digital badge and micro-credential process provides both intrinsic and extrinsic learners a tool for successfully engaging in personal learning style preferences (Filsecker & Hickey, 2014).

Intrinsically motivated employees thrive on employer recognition. Extrinsically motivated workers seek ways to avoid sanctions or to earn an outward show of success. When employers recognize digital badges and micro-credentials earned by employees, intrinsically motivated employees feel a sense of self-accomplishment and fulfillment, as well as an appreciation for being formally rewarded. For extrinsically motivated individuals, the focus is not on the motivational levels but on the accomplishment of established goals and escaping employee sanctions (Janzow, 2014-2015). Individuals who are intrinsically or extrinsically motivated may prefer to engage in earning badges or micro-credentials in non-competitive engagement activities in which personal performances ensure recognition. Lack of workplace competition allows individuals to engage in a pace that is comfortable and personally rewarding (Ferdig & Pytash, 2014).

If one than one badge or credential is sought, individuals may earn a progression of rewards. Internally motivated earners may reap inner satisfaction from viewing a job well done. Earners who are externally motivated may count the number of rewards as visual proof of avoiding a punishment resulting from failure. If open badges are used, earners may keep a portfolio of earned digital badges or micro-credentials that add to resumes or can be displayed on social networks or other public medias for others to see. These open digital badges and micro-credentials provide basic elements that motivate both intrinsic and extrinsic earners (Ahna et al., 2014).

Digital badges and micro-credentials motivate both intrinsic and extrinsic earners to win badges or credentials. Intrinsic earners find the process of engagement fun and enjoyable. Earning badges and micro-credentials are part of the enjoyment and add to the satisfaction level of engagement and begin successful. Conversely, extrinsic earners are externally motivated to be successful and be recognized. The process may not be pleasurable, but the reward is worth the sacrifice (Abramovich et al., 2013).

Digital badges and micro-credentials are exponentially replacing classroom assessment grades and degree certificates. Students earn digital badges and micro-credentials rather than a final grade that may or may not represent a true assessment of learning outcomes. In the workplace, employees can earn or upgrade new or existing areas of expertise that may be open for employers to view. Both intrinsic and extrinsic digital badge and micro credential earners benefit from earning visual rewards that inspire recognition from others (Randall, Harrison, & West, 2013).

8.1 Scaffolding and Hierarchical Learning

Scaffolding learning is the process of facilitating deeper learning by providing support for the learners throughout the process (Sawyer, 2006). It is a very effective approach for teaching complex concepts and problem solving. Scaffolding approach has three major components, first learning should occur with collaborative interaction between learners and instructors. Second Instructor should identify learners' Zone of Proximal Development (ZPD) and facilitate learning within learners' ZPD, third the support and guidance should be removed as learner become proficient (Beed, Hawkins, & Roller, 1991; Palincsar, 1986).

Instructors needs to develop close interactions with learners to identify their ZPD to facilitate adequate support and adjust the support as learners gain the skill and knowledge. To this end, scaffolding can be effectively implemented in a small face to face classroom and it would be difficult to adopt scaffolding instruction with a face to face large group of learners or in online setting. Digital badges can help instructors overcome these barriers and adopt scaffolding in online settings and by assisting instructors identifying learners' ZPD and their gradual improvement throughout the process. As the leaners gain new understanding they can be awarded badges and instructors may adjust support level accordingly.

8.2 Competency-Based Learning

Competency-Based Learning is when a learner is able to progress to the next level based upon previous documented mastery in a particular subject. When designing digital badges, it is important to design the curriculum or course in a manner that allows individuals to progress to the next level. Digital badges are viewed as alternative assessments and that is why they should be aligned closely with learning objectives to document a learner's progress. As students earn badges, they receive feedback on their learning progress (Randall et al., 2013). The key approach is to ensure that the digital badges represent the content that has been mastered. For the competency-based learning model, it is necessary for both administrators and educators to measure where student mastery is occurring and which skills need to be addressed in another module.

Instructional designers need to think about the following as they are trying to implement digital badges:

1. How many digital badges are to be awarded throughout a specific unit using the competency-based learning model?

2. How many learning objectives should be linked to a given digital badge?
3. What type of legend could be used to help both administrators and instructors determine mastery for a variety of concepts on any given learning track using the competency-based learning model?
4. How cost-effective would it be to have a myriad of digital badges for a competency-based learning model that has many learning tracks for a degree or educational program?
5. How would digital badges be awarded to collaborative learning groups based upon individual learners' contributions to the collaborative project?

These are five questions that must be answered prior to designing digital badges for competency-based learning.

8.3 Game-Based Learning

Game-Based learning (GBL) refers to using game playing principles to teach learners in real life settings (Trybus, 2015). Engagement and rewarding are the key principles in game-based learning (Gee, 2013). Learners get involved in learning activities and gain rewards and incentives that motivates them to further engaged in the learning activities. Digital badges can be used as incentives to recognize learners' progress and stimulate them to further engage them to earn badges. Additionally, digital badges can add fun and opportunity for the learners to take pride of their accomplishments.

Higher education and corporate settings are becoming increasingly interested in using game based learning as a more effective way of teaching as compared to traditional teaching methods. Digital badges can be used to facilitate game based learning in higher education institutions and corporate settings.

9 Conclusion

Digital Badges or Micro-credentials furnish earners genuine, official records that demonstrate worthy contributions have been made to a community in which earners have the opportunity to share accomplishments. To enhance resumes, earners have the option to include Digital Badges or Micro-credentials as evidence of being trained and qualified in a specific skill. Digital Badges and Micro-credentials play an important role in how individuals improve self-achievement and self-assess. Digital badges display achievement levels that are significant to the bearer of Micro-credentials and badges and to the community (Fontichiaro & Elkordy, 2013).

Digital Badges and Micro-credentials provide opportunities for the use of different learning styles and alternative assessment modes. Digital Badges can be designed to accommodate earners' preferred learning styles and multiple intelligences that help earners construct and apply knowledge to a given situation

(Echeverri & Sadler, 2011). To accommodate individual learning styles, assessments may be based on whether earners are extrinsically or intrinsically motivated (Janzow, 2014-2015).

Digital Badges and Micro-credentials include designs and approaches that can incorporate game-based and competency-based learning. Earners can engage in scaffolding and hierarchical learning strategies that promote higher rates of engagement and focused achievement goals. MIT, Yale, Purdue, Carnegie Mellon, and organizations such as Smithsonian, Disney-Pixar, and NASA are using badges for honoring and commending learners or employees improved skills, knowledge, and accomplishments in education and in workplace development (Stebbins, 2013). In the workplace, employers may use Digital Badges and Micro-credentials to recognize employees for individual or team accomplishments and productivity (Mozilla Foundation, 2011). Digital Badges and Micro-credentials are authentic documentation of an earner's productive engagement and success.

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Chapter 16
Digital Badges: Purposeful Design in Professional Learning Outcomes for K-12 Educators

Kristin Fontichiaro and Angela Elkordy

Abstract For K-12 educators in the United States, ongoing learning while in practice is intended to keep their pedagogical, technological, and related skills current and sharp. In too many cases, however, this learning is measured only in "seat time," or the number of hours spent in a professional development (PD) session, with little to no regard for the quantity or quality of learning, implementation in the classroom or learning outcomes. PD may lack follow up or tailoring to individual teachers' needs and interests. Digital badges, a version of microcredentialing, offer an opportunity to go beyond a seat time paradigm to more accurately and vividly document professional learning. As flexible boundary objects, digital badges can effectively communicate the learning content of a professional development session, and track types of learning over time. Additionally, badges challenge PD workshop leaders and attendees to create value from PD sessions, and reach beyond PD and into classrooms, connecting PD concepts to real-world implementation of concepts.

Keywords K-12 professional development • Teacher learning • Models of professional learning • Adult learners • Competency-based learning

1 Introduction

You are a middle school principal. Two English teachers have convinced you to set aside funding to send them to a professional development (PD) conference. Both say they need exposure to new ideas and practices. Both return on Monday morning

K. Fontichiaro (✉)
University of Michigan School of Information, Ann Arbor, MI, USA
e-mail: font@umich.edu

A. Elkordy
National College of Education, National Louis University, Chicago, IL, USA

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with continuing education certificates acknowledging their attendance. What do they know now that they didn't know earlier? What did you get for your (the district's) money? Right now, it's hard to tell. Mr. Smith attended five inspirational author talks. He will have some new anecdotes to share with students, to be sure, but his pedagogical growth and change are unclear. Ms. Jones went to a workshop about a new approach to planning for Socratic seminar discussions, a strategy that can help develop text-dependent arguments in students. You know this because, on her social media and school web pages, she's embedded two clickable graphics: digital badges. You click the first image and see that she attended the literature circles session. OK, that tells you she showed up. But the second digital badge, when clicked, really tells a story. It communicates that, upon return from the conference, your teacher submitted her Socratic seminar lesson plan and reflection paper to the workshop organizer, who reviewed and approved the work, and then issued a digital badge. Now you can click on it to see exactly what Ms. Jones learned—and, more importantly, applied—as a result of your conference sponsorship. You may even be able to view the work she completed (it may be attached to the badge as *evidence*). Which teacher's experience do you want on your team? Which would you send to the next conference? Which has demonstrated that the conference has changed her professional practice? Which teacher can directly connect the money spent on PD to changed student achievement in the classroom? How could such evidence-based professional development transform teaching, learning and professional engagement in your building?

Now imagine that you facilitated one of those concurrent sessions. As a trainer, you were able to add your session to your resume or CV for credit in your annual faculty review, so you have been successful on that level. But beyond that, what was your impact on those who were in the room? You saw them laugh at your jokes, make notes at certain points and a few used their smartphones to snap images of some of the key slides. But come Monday morning, you wonder, will the teachers in your session change anything back at school? Will your workshop impact their students? How do you know? In most cases, sadly, you don't.

Change roles again: You are Ms. Jones. After completing the badge's required Socratic Seminar activities in your classroom, you decide to refine those skills. So you and the other English Language Arts teachers decide to create a yearlong action research study and critical friends feedback group to engage in ongoing readings, observe one another in action implement Socratic Seminar, and give one another constructive feedback. It's an ambitious goal but one that you really think will help your students gain some of the critical thinking and discussion skills that your state's adoption of the Common Core State Standards calls for. You just wish there were a way to get credit for all the work you're doing. Could digital badges help you set your own goals, with your principal awarding them as you complete the tasks you set for yourself and your study group?

Finally, cast yourself as the conference chair. Your favorite funder has just announced that it plans to refocus its funding on *learning* outcomes at conferences. Before they write you a check for the coming year, can you articulate to them what your attendees know and can do as a result of attending the workshop? As you review your conference blurbs, you realize that few of them articulate learning outcomes. Some don't even seem to point out what will be *taught*. Perhaps none have actual evidence of learning outcomes. Uh-oh.

In these scenarios, several overlapping concerns emerge:

- **Accountability**: What are the learning outcomes? What will change in practice as a result of the PD? What are the learning goals for a session? A conference? An individual teacher at the conference?
- **Choice and personalization**: How can educators create personalized pathways through a sea of PD choices, and how are those pathways aligned with school and/or district priorities, if school is footing the bill?
- **Extension into the classroom**: Research is clear that effective PD is collaborative, extended across time, and embedded in real classroom practice. What kinds of documentation systems could help teachers see and reach milestones across time, activity, and growth?
- **Granular documentation**: How can K-12 educators, many of whom joke that they never make another resume after they get their first teaching job, document learning in ways that matter? What is the kind of learning that should be documented? What kinds of scaffolding help guide practitioners into documentation that matters, that provokes reflection, and that guides future decision-making?
- **Action over input**: How can K-12 educators play a more active role in their professional learning? How can their professional learning time be more valued and valuable?
- **Making learning visible**: How can PD learning goals and outcomes be made more transparent? When goals are visible, they are more effective in influencing purposeful action towards objectives.

We are frequent professional development organizers and facilitators, and these are concerns and questions we think about. Each time we step in front of a group, we see a wide range of educators. We may be called in to guide conversations about a disciplinary topic and realize that the *specials teachers* (those teaching subjects such as music, art, and physical education) have no connection to it and are sitting forlorn at the thought of a few good hours about to be "wasted." We hear teachers tell the student teachers they are mentoring to just sit quietly during PD; most PD is about fads and will go away, so it is not worth engaging in. We see teachers who are proud of their practice but checked out during PD. One size (or topic) does not fit all for learning in the classroom, so why then do we expect it will work for our teachers? Worst of all, we see those same teachers queued up like schoolchildren to sign in and sign out to document their attendance, the only measure of learning that is collected. Does the current system of tracking hours contribute to learning that builds capacity? Does the teacher feel valued and valuable? The answers are murky at best.

As K-12 educators turned academics, we think there's a better solution on the horizon: to harness the affordances of digital badges for K-12 professional development. We see the nascent digital badging movement as having power and potential for helping teachers and school administrators reclaim agency over their PD paths.

We see the metadata required of digital badges as valuable evidence that helps to resurface important conversations and planning around learning outcomes for adult learners. By transcending formal institutional structures and expanding the realm of potential learning environments from traditional conferences, in-services, and workshops to include non-traditional PD sites, including museums, libraries, and other locations, we see new opportunities for professional growth as K-12 education encounters a period of significant change.

We see digital badges as potentially powerful motivators for extending PD learning from workshops through to implementation of new workshop ideas in the classroom. And we see the power of digital badging's social media sharing and custom display configurations as helping teachers reclaim pride in their PD accomplishments and enabling them to share expertise with multiple audiences. In this chapter, we will explore these affordances in detail, mingling *practitioner sense* with what the research tells us about digital badges and teacher professional development. We conclude the chapter with implementation concerns and implications for further research.

2 Defining the Professional Development Landscape

To date, few have engaged in research regarding the impact of digital badges on K-12 professional growth. Digital Promise and Grunwald Associations LLC (2015) surveyed 800 teachers to discover their attitudes, behaviors, and knowledge about professional development and digital badges, finding that only 15 % of respondents were "even 'somewhat' aware" of the concept (p. 17). Gamrat, Zimmerman, Dudek, and Peck (2014) used badges in a preliminary study of online professional development in the sciences. Of the eight teachers they studied in depth, they found that some respondents appreciated how the combination of stamps (precursors to badges) and badges themselves helped them recall their learning in personally-valuable ways. This echoed earlier findings reported by Subel and Yutzey, in which a conference participant noted that, "it was actually good to be required to review the information at the end of the presentation so I could fill out the form [to earn a badge]. It solidified the information betterin my mind" (2013, p. 37). Diamond and Gonzalez (2014) studied badges issued by a reputable social studies PD organization and noted high interest and value in the PD materials but low levels of participation in badge-gathering. These studies indicate that additional research in K-12 PD will add informative value to the badging movement.

While research on *badges* in PD is nascent, research on PD in K-12 is abundant, and the results are remarkably consistent across decades and contexts (e.g., Garet, Porter, Desimone, Birman, & Yoon, 2001), providing a rich basis upon which to add digital badge discussion. Therefore, it is this research that researchers must weave into any study of K-12 PD and the potential of badges.

What is professional development in educational contexts? According to Learning Forward, a U.S. organization focused on K-12 professional learning, "The term 'professional development' means a comprehensive, sustained, and intensive approach to improving teachers' and principals' effectiveness in raising student achievement" (Learning Forward, n.d.-a). According to Loucks-Horsley, Stiles, Mundry, Love, and Hewson (2010) there is widespread consensus regarding quality PD for teachers:

> [I]t is directly aligned with student needs; is intensive, ongoing and connected to practice; focuses on the teaching and learning of specific academic content; is connected to other school initiatives; provides time and opportunities for teachers to collaborate and build strong working relationships; and is continuously monitored and evaluated. (p. 5)

Despite the extensive research base and the significant national emphasis on educational reform, however, most teachers do not participate in quality professional development. In a status report for the National Staff Development Council (renamed Learning Forward), researchers described how "American teachers say that much of the professional development available to them is not useful" (Wei, Darling-Hammond, Andree, Richardson, & Orphanos, 2009, p. 5). Furthermore, the report stated that nine out of ten U.S. teachers have participated in professional learning consisting of primarily short-term conferences or workshops despite research to support sustained professional development (Wei et al., 2009, p. 5). Findings of the report pointed to a lack of suitable infrastructure to support high quality professional development and made a recommendation to "assess the impact of … efforts over time" (Wei et al., 2009, p. 27). When the majority of PD is conducted as short-term workshops or conferences, completely disengaged from the contexts of implementation, it is no wonder that U.S. Secretary of Education Arne Duncan has remarked, "Professional development is generally of poor quality" (Duncan, 2010, n.p.).

Therefore, the call today is to shift from *getting PD* to *learning through PD* to *learning in PD that leads to better teaching*. When the focus shifts instead to professional *learning*, the learners (the classroom teachers) engage actively and make explicit connections between the PD and their pedagogy and content, both during *and beyond* formal PD settings. In their comprehensive review of professional development literature and their own GLOBE study, Penuel et al. (2007) found a similar result: that implementation of changed teaching practices was not significant after a first interaction with PD but after sustained PD interactions over time. Indeed, this idea of sustained practice has been echoed by many others with vocabulary like communities of practice, professional learning communities, common or collaborative planning time, teacher book clubs, charrettes, and critical friends.

Just as traditional classrooms assumed that teacher lectures would cause student learning, traditional professional development assumed that bringing in an expert speaker or sending teachers to a standalone workshop session would result not only in teachers learning *but also* that they would implement that learning into their classroom. Such assumptions were so prevalent that success was, and remains, measured in minutes: including continuing education hours, measuring attendance, and more. However, *seat time* is an inadequate and measurement: it cannot articulate, measure, or communicate learning outcomes, nor was it designed to. The system asks teachers, for all practical purposes, to "sit" through professional development, usually in observation mode, which contradicts the premise that PD should foster the development of engaging and effective instructional practices. To measure learning merely by one's ability to stay in the instructional space for the required amount of time is disrespectful to the professionalism of educators.

Viewed from a situative perspective of learning, Adler (2000) commented that teacher learning "is usefully understood as a process of increasing participation in the practice of teaching, and through this participation, a process of becoming knowledgeable in and about teaching" (as cited in Borko, 2004, p. 37). In other words, effective professional learning should foster teachers' abilities to perform better in their communities of practice and in the context of their practice. All too often, the "development," that is, the new skills, knowledge, dispositions, or mindsets, is unclear to all stakeholders. Most educators have attended at least one in-service PD event where they have been unclear about what we are meant to take away, do, or change as a result of attendance. When Digital Promise and Grunwald Associates LLC surveyed over 800 teachers about the types of professional development in which they engaged, and then about their level of satisfaction in those activities, nearly half of all respondents in all categories expressed dissatisfaction in the experience (2015, p. 15). (A search on Pinterest for *professional development humor* reveals the extent of many teachers' dislike for PD.) The problem is trifold: workshop leaders have little incentive to improve; teachers learn to "just sit through it"; and administrators have unclear returns on their investments of time, money, and resources. As a result, teachers in particular often approach professional development as an imposition instead of an opportunity to engage in real growth. Without authentic and useful learning targets as well as clear learning outcomes, it's no wonder teachers often feel that district-wide or mandated PD misses the mark. When learning outcomes are unclear, it is difficult to measure success beyond the likeability of the presenter and one's affinity for the workshop topic (neither of which impact student achievement) or the aforementioned seat hours. Without agreed-upon learning outcomes as a guidepost, sponsoring administrators do not know what to expect of teacher participation, teachers do not know how to show what they have learned, and workshop leaders cannot fulfill their mission of building student capacity through teacher skills improvement.

Professional development practice must develop new measurements of success. *Having* PD is insufficient: better PD shows *results.* No longer is it sufficient for administrators to say, "We had a workshop about this," or for professional organizations to say, "We had a session on that." The need is for professional development to shift from teacher-as-recipient to teacher-as-learner to teacher-as-enactor. Easton (2008) recognized this shift, recommending that the term "professional development" be renamed "professional learning," stating:

> In education, professional development has, in fact, often been what someone does to others. The back-to-school speaker holds forth in order to motivate the teaching staff for the coming year. The specialist arrives from the capitol to increase teachers' knowledge of state standards. The university professor advances the careers of educators through courses that offer credits to move them up on the salary scale (p. 75).

Therefore, the path forward for improving professional learning is a complex one for educational administrators. This chapter does not attempt to smoothly pave all aspects of this journey. However, well-crafted digital badges can be powerful levers for encouraging and acknowledging professional growth in significant ways that benefit many in the education ecosystem. In this chapter, we propose how digital badges can help with designing, individualizing, structuring, assessing and communicating the impact of meaningful professional learning experiences.

3 Digital Badges as Levers to Support Best Practices in Professional Learning

Badges and other symbols of accomplishment have been used in various capacities for centuries to acknowledge accomplishments and confer privileges, specifically of a professional nature, from Ancient Greece's Olympian laurel wreaths to military insignia (Halavais, 2012). In addition to continuing practices that have served to identify and honor professional achievements, such as transcripts, degree and certificate programs in higher education, and paper certificates for completion of PD activities, digital badges have unique affordances which improve upon traditional qualifications to acknowledge and communicate professional learning. This is particularly true in contexts where knowledge acquisition requires the growth of tacit knowledge intrinsic to professional communities of practice.

Research in the area of digital badges for professional learning is an emergent and developing area of scholarship. However, the effectiveness of digital badge affordances can be anticipated as a result of a robust existing research base in the field of education around the adjacent areas of teaching, learning and assessment. Digital badges can motivate and scaffold learning with specific goals; recent research on the use of digital badges to motivate students has suggested that, in certain contexts, their use can motivate learners to achieve (Abramovich, Schunn, & Higashi, 2013; Elkordy, 2016). Furthermore, as a technology-mediated credential, digital badges can effectively communicate to multiple audiences, across multiple platforms, including social media and teacher web pages.

Learning Forward's overview of the Standards for Professional Learning states, "Increasing the effectiveness of professional learning is the leverage point with the greatest potential for strengthening and refining the day-to-day performance of educators" (Learning Forward, n.d.-b). Digital badges have the potential to help shift the larger conversation about teacher growth from quantity (counting hours) to quality (the purposeful acquisition and implementation of targeted skills and dispositions). By fostering meaningful, measurable, professional growth, we believe we can increase educator effectiveness.

The fundamentals of digital badge creation have been discussed earlier in this book and as a result, we will not repeat them in this chapter. Instead, let us return to the questions raised in this chapter's introduction and discuss how digital badges can, or already are, positively influencing these areas of concern.

3.1 Accountability

Most states require that teachers and districts keep a paper and/or digital record of professional learning hours achieved. One digital example of this is Kalpa Professional Development Management System (kalpapdms.org), in which districts input metadata, including dates, time, and learning objectives about approved activities and teachers' participation in those activities is verified by PD leaders. Some U.S. states, such as Michigan, now employ a statewide tracking system (Michigan Department of Education, 2015) for teachers. Authorized PD providers register event details, including a detailed timeline of learning activities with this system for approval by state employees. Once approved, event hosts must adhere to the pre-established timeline of events and ensure a sign-in and sign-out system for all attendees. Final attendee lists are then submitted to the state, who approves the hours in the statewide tracking system. While these systems remove paper and can help create central repositories of records, this "seat time" accountability hardly ensures that what participants take in during the PD session is being sufficiently processed or brought to the classroom.

Former U.S. Department of Education Secretary Arne Duncan described the ability of badges to "help speed the shift from credentials that simply measure seat time, to ones that more accurately measure competency" (Kilb, 2011, n.p.). Digital badges map easily to competency-based systems if designed to recognize what a learner has done and require evidence of the accomplishment. Badges don't reward educators for sitting silently during a day of PD and, upon the workshop's end, leaving the new content behind. Badges designed to demonstrate learning should require action and evidence, and the badging community would do well to impress this quality control measure on the educational community.

Workshop organizers and presenters are also held accountable when their sessions are being badged. Consider sessions organized by professional organizations in which the presenter's focus is more oriented to "See what I did?" than, "How can I help you grow as a professional?" Digital badging pushes session presenters to think as educators and, as in the Backwards Design framework (Wiggins & McTighe, 2005), to consider critical questions about the knowledge to be gained, evidence of that knowledge, and stepping stones to attain that new knowledge (Table 16.1).

3.2 Choice and Personalization

One of the challenges for any school district is providing PD that has classroom value and applicability across grade levels, subjects, and students, and that aligns with district school improvement goals. Instead, it is common for "specials teachers" (such as those who teach art, music, and physical education) to be told to attend PD that does not apply to their work, such as evaluating standardized test data,

Table 16.1 Comparing backwards design to digital badges

Wiggins and McTighe's Backwards Design would ask …	Digital badges prompts for the same information by …
What do I want the learners in my session to know and be able to do?	Requiring a description of what the learner knows as part of a badge's metadata
How will I know they have done it?	Requiring evidence of success that is observed and evaluated by the badge issuer
What do I need to put in place as learning activities in order for the learners to achieve the learning goal?	Implicitly pressuring the workshop leader to be planful in workshop activities lest the evidence not be within the learner's ability to achieve

enhancing written prompts in content areas, or establishing morning meeting routines (Kriete, Bechtel, & Northeast Foundation for Children, 2002) with elementary students. (Imagine the reverse: a room full of high school teachers sitting regularly through PD on how to improve music composition skills, brush work, or upper arm strength!)

The digital badging movement invites a more personalized way of describing learning. Like the Connected Learning movement (Ito et al., 2012), digital badging recognizes learning in both formal and informal learning spaces. By expanding a district's view of who can act as potential professional developers, digital badging extends the customization possibilities for professional learning. If a district is willing to accept badges from a local museum, library, art center, or professional gym as evidence of professional learning for the specials teachers, for example, then more customized PD is available without increasing the cost and energy footprint of the district.

3.3 Extension of Professional Learning into Classroom Practice

For nearly 20 years, researchers and PD experts have agreed: merely attending one-time workshops has little impact on classroom practice (e.g., Easton, 2008; Lumpe, 2007; Stein, Smith, & Silver, 1999). School-change pioneer Michael Fullan (2007) states:

> The notion that external ideas alone will result in changes in the classroom and school is deeply flawed as a theory of action. I am not only referring to irrelevant or poorly conducted professional development, but also to sessions that meet the highest standard of adult learning. These activities are not useless, but they can never be powerful enough, specific enough, or sustained enough to alter the culture of the classroom and school. (p. 35)

More important than the recognition that external growth activities are insufficient, is the increasing scholarship on the critical need for professional learning to be integrated directly into the in-school, quotidian practice of teachers (e.g., Blumenreich & Falk, 2015; Darling-Hammond & McLaughlin, 1995; DuFour & Eaker, 1998; DuFour & Marzano, 2009; Wei, Andree, & Darling-Hammond, 1999).

This integration can take many forms: study clubs, professional learning communities, lesson study, social media conversations, co-teaching, building-wide self-directed initiatives, and more (Abilock, Fontichiaro, & Harada, 2012).

3.4 Granularity of Documentation

Traditionally, when preservice teachers completed their higher education coursework and began to apply for jobs, they submitted a resume and, when asked, provided letters of recommendation as well as a transcript as evidence of past learning experiences. Resumes provided job history; transcripts displayed acuity and accomplishment in academic arenas, as well as coursework to which the student was exposed; and cover letters gave insight into how others saw the candidate as a person and budding professional.

Beginning in the mid-1990s, preservice teachers began to add online or physical portfolios as evidence of their preparedness and experience (Antonek, Mccormick, & Donato, 1997; Doolittle, 1994). The portfolios contained anything from reflective journals or blogs to lesson plans, designs for classroom layouts, examples of their students' work, letters of reference, and statements of teaching philosophy. In many ways, portfolios provided a turning point in how candidates showed potential employers who they were *as a teacher* through artifacts of teaching. Sadly, however, once a teacher has been hired, few maintain these repositories of evidence of professional practice. More likely, a teacher will create a LinkedIn profile, social media account, or classroom web page. Beyond the aforementioned lists of PD "taken" each year, a teacher's growth is rarely noted again formally during his or her career. This is a significant opportunity lost for both district administration and educators.

Digital badges offer opportunities to continually build and amplify professional accomplishments throughout one's career. Being asked to gather and display one's badges is an implicit or explicit invitation to reflect on one's growth and envision future pathways. The portability of Open Badge Initiative-compliant (OBI-compliant) badges means they can be displayed where teachers already have a presence: LinkedIn, Twitter, Facebook, and their classroom web pages.

Digital badges mean that they can display their learning beyond uploading a certificate of completion. Instead of reading on Ms. Richardson's list of 2015–2016 PD activities that she attended a weeklong English Language Arts workshop on video production, which might yield a certificate of completion, a principal can now see badges specifying which pedagogical, content, and soft skills she has earned. The flexible size of badges allows larger initiatives to be sub-divided into small badges that can, in turn, be exchanged for more valuable "mega badges" (Kim, 2015). Gamrat et al. (2014) used *stamps* for low-intensity tasks and Mozilla-compatible *badges* for more comprehensive ones. Because digital badges do not require that learning tasks be of a certain size or require a certain amount of time, they are *right-sized* for tasks at hand. Whether activities for a yearlong lesson study project take a day or a week, a badge can be earned.

Consider the impact of seeing a list of badges like these for her:

- **Team Building Badge**—awarded to workshop participants who were nominated by their collaborative work groups for their outstanding skills at building team spirit (soft skill)
- **Screenwriting Formatting Badge**—awarded to participants who mastered the formatting techniques (e.g., use of capitalization, centered text, standard margins, etc.) used by professionals in screenwriting
- **Critical Friends Badge**—awarded by the instructor based on visual observation of excellence in employing the Critical Friends feedback technique during scriptwriting sessions
- **Storyboarding Badge**—awarded by the instructor for having created a six-panel, black-and-white, hand-drawn storyboard for a 32nd public service announcement

Now a principal, teaching colleague, or K-12 student knows exactly the kind of skills and behaviors this teacher is able to exhibit instead of making assumptions. The guesswork is eliminated because the granularity of the badge fits the specific accomplishments. So while Ms. Richardson has now shown some ability in creating stories for video, which might demonstrate that she has the skills and experience to teach a new screenwriting elective, her principal probably wants to look elsewhere when a videographer for the senior prom is needed.

3.5 Action Over Receiving Input

Traditional PD is passive, something to be received (Easton, 1998). The presenter is the one doing the heavy cognitive lifting: acquiring, organizing, framing, and presenting content to the teachers in the room. The very tasks that lead to teacher growth and the ability to shift daily instructional practice remain in the hands of the instructor, not those who need the knowledge. While many of the PD researchers mentioned throughout this chapter have decried this style of PD for going on 20 years, this passive PD remains so prevalent that its nickname "sit and git" remains on teachers' lips today, and veteran teachers whisper to novices, "Just sit quietly—this trend will go away soon."

By contrast, when a district chooses to adopt digital badges as a tool, it adopts competency-based learning as part-and-parcel. In fact, Brandman University chose a digital badging system to accompany its new competency-based education framework (Credly, 2015). Stein and Farmer (2004) define competency-based education as focusing on observable, assessable *outcomes* of learning. Learning doesn't just *happen*, it must be observed or inferred in some way. There must be *evidence*. Digital badges fit neatly with competence-based learning because they can contain this evidence. This may come in the form of a teacher-created object that demonstrates learning that is photographed, video-recorded, or created online and linked to the badge itself. In some cases, the learning is observed. But it must be *present* for a badge to be issued.

The very nature of this evidence means that digital badges shift the teacher's role during PD from "sit and get" to *learn and show.* Teachers are no longer the end-of-the-line *recipients* of others' knowledge; like their students, they are expected to engage actively with content, make sense of it, and show that they now understand and have a stated level of fluidity with it. A district administrator who wants her teachers to be more active in their PD can now use digital badges as the lever.

3.6 Making Learning Visible

Many American schools have long functioned under as "egg cartons" (Lortie, 1975, in Spillane, Halverson, & Diamond, 2001), a metaphor describing how each teacher tends to work alone in his or her own classroom. While school reforms of the past 50 years, including open schools, middle school scheduling, common planning time, co-teaching, and common students shared among a team of teachers have worked to break the silos between individual teachers, much of teachers' knowledge and growth is hidden from one's colleagues, not to mention one's administrators.

Digital badges' flexible display options make it possible for professional learning that was once restricted to paperwork or web databases, squirreled away from anyone's view, to be made public. Imagine that Ms. Rodriguez and Mr. Mbeki both teach in a large urban high school on different floors. Ms. Rodriguez is a veteran teacher who has been working on gaining skills, knowledge, and practice in the Read 180 program to motivate reluctant readers. Mr. Mbeki is also a veteran teacher, but he just switched to a new content area that requires teachers to use Read 180. In the past, the only way Mr. Mbeki would know of Ms. Rodriguez's abilities and potential to be an in-house mentor would be through the school grapevine. If, instead, teachers share their badge displays across faculty, finding the needed mentorship becomes more obvious. This builds school capacity more rapidly while saving district funds. This sharing is envisioned by school librarian Laura Fleming at New Milford High School, who, in envisioning her school's use of digital badges to document professional learning, wrote, "The badges will also of course be showcased on the Worlds of Learning @ NMHS site" (Fleming, n.d.)

4 Concerns About Digital Badges and Implications for Future Practice and Research

While we are optimistic about digital badging's potential in K-12 education, we would be remiss to not share concerns about its successful implementation. Most notably is mapping a new method of PD documentation onto a system that many educators hold in suspicion. In the 2015 survey conducted by Digital Promise/Grunwald Associates LLC, 84 % of respondents noted participation in in-service days, non-instructional days in which students stay home and teachers engage in PD, but only 20 % reported satisfaction with them. In a recent presentation, Catalano (2015, slide 23) noted, "Open Badges have failed to take off in K-12 schools as much more than digital gold stars for motivation during school and for after-school activities." Yet in his next slide, he articulates that open badges could gain traction with professional development in K-12. It is a curious tension. In this section, challenges to implementation will be discussed.

4.1 School Culture

Though digital badges appear to be an info-technological construct, it is essential not to forget their human component. K-12 schools have a complicated culture informed by political, social, familial, and other influences. Badges will not change a school culture; rather, they will reflect them. A top-down, authority-driven district is likely to implement them in a top-down, authority-driven way, which will not facilitate the individual pathways to learning that badges were meant to foster. Historically, for example, military medals and patches encapsulated within them the larger hierarchical system that valued authority and sacrifice (Halavais, 2012). Similarly, a laissez-faire school culture with low or unarticulated performance expectations is likely to implement a badging system where little needs to be done to earn a badge, resulting in numerous awards, but little growth (and little value of badges). Whereas one district might be empowered by the transparency discussed in the earlier section, another may feel threatened that such transparency exposes or sets teachers in competition with one another. Therefore, before embarking on badging projects, a formal or informal assessment of school culture can help determine whether now is a good time to implement digital badges, and whether Open Badges are a fit for the district's approach. Clear explanations of why a district or organization is badging, how badges will be *counted*, what privileges badges will earn or unlock, and more can help set common expectations.

It is also important to recognize that K-12 schools have many existing programs to earn points, badges, or stickers, and differentiating digital badging from existing book club points, sticker charts, checklists, reading points, or Catalano's "digital gold stars" (2015, slide 23). In a 2012 project to badge the Ohio Educational Library Media Association, some attendees confused badging with the kinds of games (such as visiting a certain number of vendors) often found at such conferences. They were disappointed not to receive a prize in return for their badges. This problem was complicated by the fact that informational materials either went unviewed prior to the conference or were not distributed with conference materials (Fontichiaro, Ginsberg, Lungu, Masura, & Roslund, 2013, p. 7). Strong pre-event guidance will help differentiate badging from other extrinsically motivated systems and keep the focus on intrinsic learning, not on gaming the system for points.

Additionally, there is an underlying tension in many K-12 districts between some parties' desire for quick-fix changes and others who cling to the powerful stasis of the status quo. Framing a digital badging initiative around existing cultural norms can help facilitate success. More study is needed on how existing district culture and homegrown digital badge implementations (e.g., not driven or coordinated by outside organizations or research teams) coordinate or clash.

4.2 *"All Dressed Up, No Place to Go"*

Digital badges, although based on earlier systems like scouting's merit badges, are a relatively new initiative, having launched in Fall 2011 (Gibson, Ostashewski, Flintoff, Grant, & Knight, 2015). While it is becoming easier to create and earn badges, there is still no real, on-the-ground avenue for leveraging earned PD badges in school, at play, or at work, with the exception of badges earned in video games. Said more clearly, What do teachers get out of earning digital badges? What motivates them to change? As one participant in the Ohio conference project said, "What's the point of these things?" (Fontichiaro et al., 2013, p. 6). Teachers may earn badges alongside traditional continuing education units, but to date, there is little evidence that badges are more than a new medium for tracking what has always been tracked. Hence, the unique affordances of badges have yet to be realized. Few, if any, school systems or state agencies accept badges in lieu of more traditional measures. Organizations such as Digital Promise are seeking to change this, but the change is slow in coming. Additionally, it is rare to earn a badge that unlocks privileges, qualifies a student for more advanced coursework, or gets an employee a raise. Teachers need to know that their badges will *do something* productive for them. Given their negative experiences with professional learning, their questions may not be that different from the Ohio educator who said, "Is this just one more thing I have to learn/pay attention to/spend time on?" (Fontichiaro et al., 2013, p. 6). Short-term extrinsic motivators, such as offering prizes or special recognition for earning a particular quantity or variety of badges, may seem gameful at first but ultimately shift the power and potential from the teacher to an external force—a risky proposition. For badges to take systematic hold in global society, badges need to be useful as currency; otherwise, badge earners are "all dressed up with no place to go."

4.3 *Novelty Effect*

Psychologists use the term *novelty effect* to describe an initial surge of enthusiasm that later tapers off. Novelty effects are particularly common with new technological advances (see, for example, Henderson and Yeow, 2012). With the badging movement and its accompanying research, and practitioner-based lessons so new, it's difficult to determine long-term viability or success. Teachers are used to seeing other tools and resources, teacher evaluations, school ratings and rankings, school funding formulas, curriculum standards, Web 2.0 tools, and more, come and go. Teachers who see digital badges as just another fad or as merely "old wine in new bottles" (the same top-down requirements, only with a digital badge instead of a picture) are likely to lose interest quickly. The success of any new initiative must be measured against how it holds up after its newness wears off.

4.4 Assessment Challenges

In the earliest years of the digital badging movement, the energy went primarily into software development, developing interoperability standards, and getting people excited about the prospect of digital badging. An informal review of the Mozilla Open Badges Google Group (https://groups.google.com/forum/#!forum/open-badges) shows that an overwhelming percentage of posts focus on the technological infrastructure, with almost no posts devoted to into how to design effective badge criteria and metadata, most critically around how to write expectations for and assess evidence of created works. Consider this snapshot: a single MacArthur Foundation press release. Then-Director of Education Connie Yowell said that Open Badges provide "an alternative and more in-depth method to demonstrate new knowledge and skills" and "give(s) employers a new way to assess critical but hard-to-measure skills such as creativity, communication, teamwork, and adaptability." In the same release, Nichole Pinkard of DePaul University stated that, "Badges give you a better sense of who the applicant is. They give you a stronger sense of quality," and David Theo Goldberg of the University of California, Irvine, said open badging will "provide employers ways of recognizing less visible skills and capabilities of potential employees" (all MacArthur, 2013). These are exciting promises that, if brought to reality, would be powerful indeed. However, those working in K-12 or higher education know how difficult it is to assess and measure soft skills in a robust way. Giving away a digital badge does ease that difficulty; therefore, it is imperative for the movement to reach out to assessment experts and partner in the deep work of designing, testing, and disseminating strategies for how to outline and assess evidence effectively.

If this work is not done, then only what is easy to measure and assess will be badged. Consider a PD session to promote makerspace learning in schools. A badge earned for "My robot was able to move" is much easier to assess than, "The badge recipient demonstrated perseverance during the construction process" or, "The microcontroller's design was creative." As those in the standardized testing movement know, it is easy to measure what is obvious or countable and quite difficult to determine soft skills. Digital badging advocates must begin to devote energies into how to assess the difficult things, or only simplistic tasks will be badged, giving the movement little momentum as a result.

4.5 Standardization Beyond Code

The digital badging movement has grown in great part because of the underlying Open Badge Infrastructure, which allows badge issuers to create custom platforms for earned badges to be (essentially) merged by the earner into a single Mozilla-hosted *backpack*. It is the standardization of code that makes this possible. No similar standardization of evidence, task size, or granularity exists for badged challenges themselves. As of the writing of this chapter, digital badging intentionally positions itself as an alternative to existing measures of professional learning such as *seat time* or *Carnegie credit hours*. As the digital badging movement matures, however, there may come a time when such standardization (e.g., "each badge takes approximately five hours of work") actually makes it easier to facilitate the creation of a large number of custom paths through PD.

Such standardization might also be a way of imposing ad hoc quality control over badges for learning organizations. For example, for the Detroit Public Television (Michigan, U.S.A.) Be Summer Smart pilot in 2015, almost 20 organizations were brought together in a short time frame under a common badging system to issue digital badges to youth and families. Because they had observed a common challenge among novice badge issuers, who often equated attendance with learning (without a corresponding assessment to see if learning had actually occurred), Fontichiaro and Waker (2015) created tiers of badges that would help new teams avoid the rookie error of assuming learning without gathering corresponding evidence. They created three tiers of available badges so that organizations could be more careful in their learning promises:

- Novice badge issuers often claim that an attendee has learned something merely by showing up for an event. These badge issues often use attendance as a stand-in for learning without seeking further evidence. Equating attendance with learning is dangerous, because it makes assumptions that may not be accurate. Yet, sometimes showing up for an event is a precursor to learning: a chance for a learner to look around and see if a topic is of interest, so recognizing attendance need not be eliminated from digital badging: it just requires more concrete framing. *Discovery* badges were designed to recognize attendance at events. This badging level recognized that many of the pilot's participating cultural organizations had standing events that were not interactive. Rather than putting those organizations in the position of certifying uncertain learning, discovery-level badges merely acknowledge presence.
- Many cultural institutions host events where an activity is demonstrated step-by-step, with the learner following the leader. These activities show that the learner is capable of doing something with help. *Guided* badges were established to recognize learning with assistance without making the claim that the learner had achieved it independently.
- For cases where cultural institutions created challenges that did require evidence of self-completed challenges, *Independent* badges were created.

By imposing their tiered structure on participating organizations, the hope was to, with little intervention, smooth out differences between organizations' expectations.

5 Conclusion

Good teachers plan instructional experiences that engage learners by paying attention to the learning outcomes and by in-depth knowledge of their students. Great teachers provide scaffolding (a framework of learning targets and engaging resources) and coach their students to develop skills for independent learning at their own pace and level. Importantly, they know that exceptional achievement and mastery learning do not happen unless the outcomes and instructional processes are meaningful and hence valued by the learner. Most teachers would agree that skills and competencies are not developed through seat time only, and almost never without some learner accountability. Digital badges can help shift PD from *time spent* to *time respected* and *time leveraged*. Their flexible granularity, combined with their insistence on evidence and predefined learning outcomes, can help PD become more customized and more accountable. Overall, effective digital badge implementation for K-12 in-service educators can help structure, assess, and communicate growth as well as help to evaluate impact upon student outcomes at a time of urgency in K-12 education.

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Chapter 17
Height vs. Depth in Badging Framework Design

Scott Beattie

Abstract As Digital Badging matures and the technologies to issue, curate, massify and automate badges evolve, the question of overall framework design becomes increasingly crucial. If badges are to attain and maintain currency they must be contextualised in relation to other badges, as parts of sets of badges and in relation to other sets of badges. The learners of the future may well have a large number of badges to navigate and curate which may lose significance as merely part of a vertical 'stack' of badges. Designing for depth as well as height would allow the relationships, pathways and connections between badges to become more relevant in understanding the meaning of badges and in motivating learners. This chapter looks to the evolution of badging on video game consoles and its roots in the virtual persona profiles in tabletop gaming to draw on the parallel experience of design and cautionary tales of how early design decision may have later ramifications.

Keywords Digital badges • Gamification • Learning motivation • Design • Learning frameworks

1 Introduction

Current innovation in the use of learning badges has focussed on the technical issuing infrastructure, yet there is emerging recognition of the importance of design innovation in the *frameworks* of badging ("Design Principles Documentation Project", 2015; Joseph, 2012), that is, the overall design of a set of connected badges and the relationships between them and with other sets of badges. These frameworks are conceptual and organisational designs, rather than software systems and should draw on research into gamification to understand how badges can act as forms of incentive and motivation parallel to grading and inherent motivations such as curiosity and collection.

S. Beattie (✉)
CQ University, Melbourne, VIC, Australia
e-mail: s.beattie@cqu.edu.au

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Many badging frameworks are designed for ‘height’, that is to emphasise the cumulative importance of earning an increasingly larger stack of badges. For instance, the Khan Academy online learning environment does this, and this draws both on the history of education (a degree program functions in this vertical way) and from the design of many game badging systems. This design can be motivating, especially for competitive learners, but it is not the only way of thinking and frameworks may also be designed for ‘depth’ in building more complicated relationships between badges, in visualising how they accumulate and build a more comprehensive and connected picture of learning.

This chapter examines some of the experience from the domain of gaming, to see how badging or achievement systems are founded on design ideas in tabletop role-playing games (RPGs) and how these ideas have spread to the mainstream audiences, through console games and even more widely through casual games. Halavais (2012) has examined the broad foundations of badging design in the scouting movement, in the military and in games and this paper seeks to explore the gaming aspect in more detail.

The technical software systems that support the issuing of badges, as well as display and curation of badges have deservedly received significant attention (Mihailidis & Cohen, 2013). This is especially important for ePortfolio systems such as *Mahara* where the integration of open badges has been an essential first step to engaging with the evolving field of micro-credentialling (Gibson, Ostashewski, Flintoff, Grant, & Knight, 2015). The next stage in evolution of these systems is the flexible integration of different badging frameworks to help learners make sense of their badge collections, provide visualisation options and ways of presenting these to others.

2 The Framework Design Layer

Design thinking and design literacies have come to the forefront as important capabilities in the creation of usable systems, including educational ones (“Design Thinking for Educators”, 2015; Glen, Suciu, & Baughn, 2014). Key to this is moving beyond the given-ness of existing structures and perceiving them as human created artefacts that can be disassembled and reassembled for different purposes. Badging systems should not uncritically accept the assumptions of either the current academic or technical structures but should build learning technologies on clear design objectives. In this chapter it is proposed that we think of badging systems in two design layers—of the underlying technology layer and of the conceptual framework layer that sits between the software and the end users.

The *technical layer* of a badging system exists in software code and allows the definition of badges and then allows an individual to issue that badge (or delegates this choice to an automated system such as a quiz to implement). Further, the technical layer defines the way the recipient can use the badge, display it in various places and curate their badge collection, choosing which to keep, which to make public and which to provide reflective commentary on. This layer exists across different software platforms and has been greatly enhanced by Mozilla's creation of open badges as a free and accessible means of communicating between different platforms (Ostashewski & Reid, 2015).

On top of this layer there is also a *design layer* or semantic layer, where the design of badges as individual artefacts and as part of a whole is represented. This layer needs to be integrated with a technical layer that facilitates and supports the design ideas. Where software issues a badge, the design layer manages the design of a badge, the ways that it represents learning through setting objectives and the relationship it has with other badges. The issuing of badges, by an individual or through automation should be part of a design framework that makes sense and is credible. The display and curation of badges involve different ways in which the system as a whole makes sense and learning can be visualised (Table 17.1).

It is in automation and in the display and curation of badges that most of the technical design work is yet to be done. Platforms such as ePortfolios and social networks can presently display individual badges, and may have some capacity to demonstrate height-oriented design (such as meta-badges earned when a certain number of other badges are collected), but there are broad new vistas of innovation in other ways of visualising badge frameworks. A learner might be able to see pathways from present learning and be able to set objectives, they might be able to anticipate how different pathway choices will lead to different destinations, to compare their learning to others, to collaborate on group badges and to shadow the accomplishment of mentors.

The term 'eco-system' has often been used in the digital badging discourse to discuss the overall context in which badges, and for that matter badging frameworks, would operate (see for example in Cucchiara, Giglio, Persico, & Raffaghelli, 2014). While badging is novel and learners have few badges, they can more easily

Table 17.1 Badging design layers

		Software		
Technical layer	Create and issue badges	Select recipients, manage groups of recipients, automate parts of the process	Display badges	Curate badges
Framework layer	Define what a badge means and the relationship with other badges, manage changes to the badging system over time as it evolves	Allow recipients apply for badges and see what other badges they may potentially plan to achieve	Represent the network of badges and the relationship between them in multiple and flexible ways	Allow comparison with peers, shadowing of mentors and other activities
		Users: creators and recipients		

attain and maintain value as learning currency. However if badges are a successful innovation and become more numerous, each will have less value and attain less meaning. Therefore it is necessary to consider growth now and design software systems and frameworks that can embrace growth and manage increasing complexity of the eco-system which will including disparate and competing badge sets.

Each of these innovations will require software infrastructure to make them happen and this software would need to flexibly designed to allow for many different kinds of design choices in the badging framework layer. This should also be intuitive enough to allow many designers to engage with framework design, regardless of technical skills. Initiatives such as the open *Badgekit* project may provide some of these tools and commercial developers are offering others, but it is the role of the open development community to ensure that innovations are shared publicly (Ahn, Pelliconea, & Butlera, 2014). While the open development community works to bring about these innovations, it is also important that we pay close attention to the design of the framework layer, drawing inspiration where we can from the design of motivational structures in other contexts, for instance games. There is also an emerging literature on the relevance of gamification as a motivational structure for education (Hamari, 2015; Hamari, Koivisto, & Sarsa, 2014; Kapp, 2012), though the present discussion will focus on specific design decisions rather than explore the efficacy of the gamification process in learning.

3 Height v Depth in Learning Badge Frameworks

The practice of design recognises that all human artefacts are created toward a function and can be evaluated in their capacity to deliver on that function. Sometimes design is not overtly addressed, especially where the design of a human created artefact is mistaken for the natural or only way to go about design, particularly where practices have been embedded for a long time. While learning badges are a new innovation, they do risk being pre-determined by longstanding educational design choices (e.g. the curriculum or the testamur) that may appear to be the natural way to represent learning.

The delivery of learning through a degree program, built on a stack of successfully completed units of study is a powerful metaphor for learning, one whose gravity risks dragging badging frameworks into assumptions that height-oriented design is the natural way to learn. It is true that the height based, collection of credentials has the advantage of simplicity (especially in determining employability) and for competitively motivated learners it may provide incentive in comparing grades to others, but not all learners, or indeed employers, think in this way. Also, like completion of a unit of study, once a learner accrues a large number of badges each becomes decreasingly relevant in context and only the total number really retains meaning.

A depth-oriented framework would allow for inter-relationships and intersections to be recognised and visualised in a way that is comprehensible to learners and others. Badges may exist in clusters, the accumulation of which may open pathways to other clusters, badges may evolve and grow or have other badges attach to them. This is certainly a more complex and winding path than a simple stack, but it may well provide more motivation for a broader range of learners. Further these design approaches are not alternatives and both may be integrated to produce height *and* depth.

The following discussion looks at the ways that these design approaches have been used in game frameworks that recognise player accomplishments over time, in what are arguably learning portfolios used by games. It will become clear that design choices made early in the process can have long lasting effects that can reach far outside the original context as the design language becomes adapted for new environments or influences (overtly or subtly) new decisions.

4 The Xbox 360 Achievements System: A Digital Badging Prototype

The development of the Xbox 360 Achievements system (and the equivalent Playstation 3 Trophy system) was a key moment in the design of gaming badges, an innovation which has filtered out into the broader community as more people become game-literate, especially with the uptake of social games outside the traditional gaming public. The creation of individual gamer profiles on the consoles allowed, for the first time the collection of persistent data about individual players and the presentation in a portfolio including the achievement badges they earned (Jacobsson, 2011).

Before this innovation, players approached each game as an individual, disconnected experience. They could save data within that game but had limited ability to share that data with others or to draw connections from game to game. Combined with online access, players could share these profiles socially and compare their achievements to friends in their personal networks, to brag or compete.

One of the most interesting aspects of the achievements is that they exist as a motivational structure that runs parallel to game completion or the overall 'high-score' that a game might award (scores are an increasingly rare feature in any case). Achievements *can* be awarded for completion of core objectives, but they also exist for digging deeper into a game, locating secret areas or items, completing specific challenges under time or other constraints, for demonstrating a level of mastery beyond that which is required for simple game completion.

Each Xbox achievement is worth a certain number of points and each game is allocated a total of 1000 points to divide up among their achievements. Players can see what achievements they have earned, which they have yet to earn (often with a hint as to how it is accomplished) and can see an overall Gamerscore which is the total of all achievement points earned from all games played.

This can have different effects on the motivation of players to explore further and seek deeper mastery. The Gamerscore has literally no other purpose but it is surprising how even cynics have been ensnared in the incentive to earn a few more badges, a few more achievement points before they put a completed game away. Committed addicts may even play games they would not ordinarily play, just to secure some easy Gamerscore points.

This also raises questions about how gamification (particularly badges) defines motivation, clearly this is not a simple form of operant conditioning, as the incentive is largely illusory. Rather than *controlling* a player/learner, there is a sense in which the voluntary adoption of an incentive framework creates meaning for the individual and facilitates other forms of motivation such as curation of digital identity. The field of gamification studies, the application of gaming-style motivation in a non-gaming context, is evolving rapidly and will no doubt provide further insights at an increasing pace (Zichermann & Linder, 2013).

The Achievements system is clearly a height-oriented framework, incentive lies in creating the largest number of badges, the biggest Gamerscore and in challenging friends. It is this approach which underpins the Khan Academy's learning badges and many other badging systems. It is however only one approach, and one which has its origins in tabletop games. The next section will explore the origins of height based 'level' systems and the alternatives which been offered.

5 Achievement Design Origins in Tabletop Role Playing Games

The idea of a persistent game portfolio was not new to the Xbox 360, although it was the in the first generation of consoles with the technology to do so. Tabletop games, which rely on rules system for their infrastructure, have a longer history. The roleplaying games (RPGs) of the 1970s, such as Dungeons & Dragons created a new character-based storytelling medium, but they also introduced the idea of different sessions of play as connected events, mediated by the character sheet, a portfolio that lists an individual skills and abilities as they evolve over time.

While these are not the same as learning portfolios and serve quite a different function, they are built on a design language which deems skill, ability and achievement to be quantifiable (as a character trait value, rather than as a grade or badge) and which allows these capabilities to develop over time, based on certain triggers that define legitimate learning opportunities.

All three cases—the learning portfolio, the xbox profile and the RPG character sheet—involve the mediation of a virtual identity, constituted from items of data. While millennials have grown up curating virtual identities via social media, this is a practice which is yet to be fully theorised. Careful and innovation design of credentialling systems can take advantage of the experience of the game discourses and create frameworks that support flexible and engaging identity practices. Committing to design principles early in the process might result in unforeseen developments later in the process as these virtual identities evolve and build over time. The use of fictional virtual identities in RPGs (long before *digital* virtual identities were commonplace) set precedents for educators to learn from. Researchers have had mixed results in trying to export the principles of videogame achievement directly into an educational setting (Abramovich, Schunn, & Higashi, 2013) and care must be take to build a framework that is tailored to the learning environment itself.

Dungeons & Dragons was the first game to incorporate an ongoing virtual persona record and it was designed toward height, with a 'character level' being the overall measure of their ability that set standards for game challenges. The next section looks at some of the design ramifications of this and then looks at a rival approach which emerged in response to this*, Basic Role Playing* which designed instead for depth. The early days of game design (as documented in Appelcline, 2015a, 2015b) were a time of innovation, but also involved design decisions that have endured, for good and ill, until today.

5.1 Dungeons & Dragons: Height Based Credentialling

Dungeons & Dragons ('D&D') (Gygax & Arneson, 1974) has its origins in wargames, particularly the skirmish based game *Chainmail*, and this influenced many of the design decisions, through the game's emphasis on combat as the primary form of conflict and through the game's continued reputation as a simple "hack and slash" game. Where previous wargames treated game sessions as discrete events (even if they were connected to a historical campaign series), D&D allowed longitudinal play, as characters evolved and changed over time.

D&D characters are primarily defined by two factors: their character *class* (a profession such as warrior or wizard) and the level they have attained in that class (for example a "5th level ranger"). Most of a character's fighting abilities, their spells and other skills are determined by the class/level dyad. As an exemplar of height-based design, the character level is simple and allows for rapid comparison between different characters and setting of challenges ("this is adventure for characters level 4–6"). While to an outsider the *character sheet* can be a forbidding collection of statistics and values for a novice, this apparent complexity was built on a height-based design concept that was simpler than it first seemed (Fig. 17.1).

These design choices are underpinned by the ideological context and there is a certain breed of radical individualism that permeates the D&D framework, where individual professional expertise is more important than gender or social class, each of which would be more likely to define a person's ability to act in a medieval setting. The D&D worlds tend to be generic fantasy in flavour (but not always), light on background or history because the focus of the game is on adventuring and particularly combat. The game has been through many different iterations which have brought their own innovations, but at core the game has adhered to the initial height-oriented design decision to maintain simplicity and appeal to the core audience.

Interesting, the D&D magic system breaks from the simpler design framework and demonstrates the problems of complexity in height based systems. Where most of the game models conflict with a small set of statistics and dice rolls, spells are

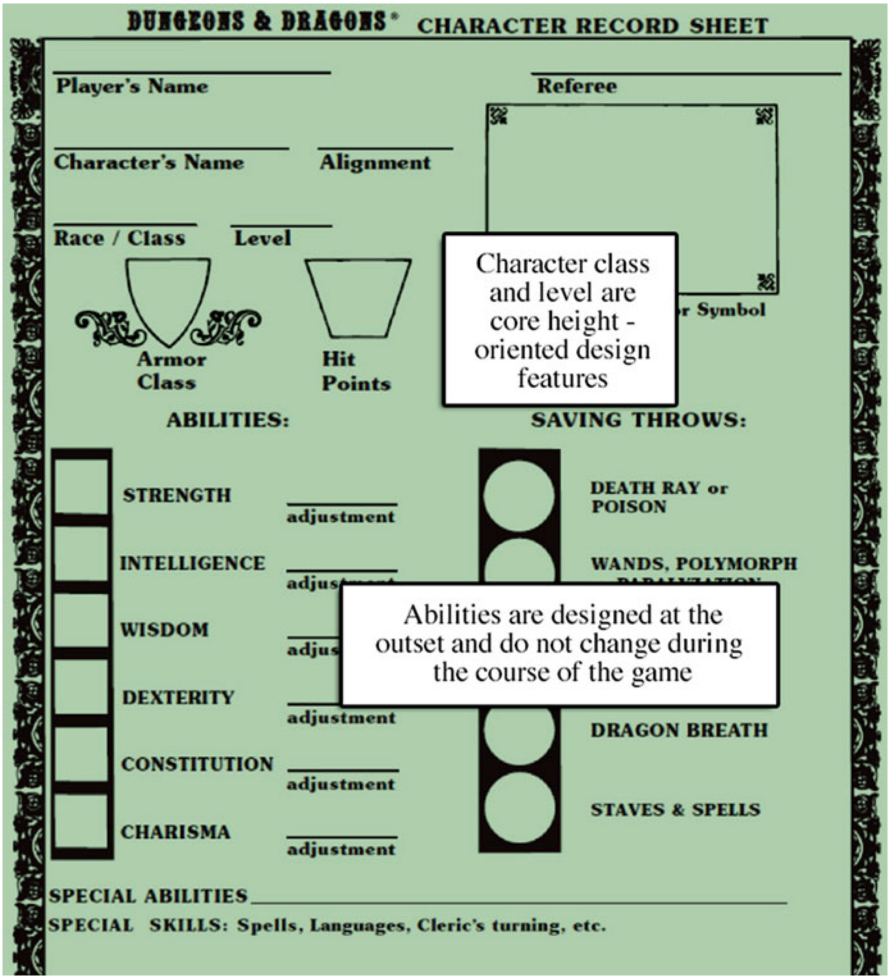

Fig. 17.1 An early version of the *Dungeons and Dragons* character sheet, modified image based on Gygax & Arneson (1974)

learnt from a large list of those available, a list which grew with further expansions and game supplements. A low level spellcaster would know a small number of spells and those spells would be a very important character feature. As the character increases in levels they learn more spells, and spells of a greater magnitude until they possess a large stack of spells which becomes increasingly unruly and difficult to manage and individual spells become less meaningful. Many players enjoy this accumulation, but it as a design decision it sits inconsistently with the sparseness of the rest of the system. Later RPGs have made different choices which result in thematically different treatments of magic as well as systemic differences.

The process of learning for D&D characters is also modelled simply, characters earn experience points for meeting certain challenges and when they accrue enough they gain another level and unlock new abilities. In the original D&D experience points were earned by defeating enemies and acquiring treasure and while later versions modified this, the game has always had at its core the notion of conquest and looting as the activities which increase character power and which are thereby privileged as game design components.

5.2 Basic Roleplaying: An Early Move Toward Designing for Depth

Basic Roleplaying ('BRP') (Stafford & Willis, 1980) was designed as a response to the limitations of D&D, it abandoned the idea of levels and character class (except as a general archetypes) and embraced a depth-oriented design philosophy which defined a character by a large number of skills. It was also more complicated and had smaller share of the marketplace.

The first BRP setting was the bronze age fantasy setting *Runequest* (Perrin & Turney, 1978) which had a much richer background than D&D, one which still retains a cult following today. Rather than solely being defined by combat a character could have a broad range of useful skills such as horseriding, bartering, crafting and persuasion.

Character advancement occurred very differently in the BRP. Each skill was defined by a percentage of success, determined by a diceroll. Where a character successfully used a skill in a game session, a tally was marked on the character sheet and the player became entitled to try to increase the skill at the end of the play session. Instead of trying to roll under the skill as they would during play, players who rolled over the skill could increase their character's skill by 5 % (thus higher skills became more difficult to increase). Under this model of learning, character advancement is determined by situational application of skill.

This depth-oriented approach never really rivalled D&D in the fantasy arena but really came into its own with the release of *Call of Cthulhu* (Peterson, 1981), a game based on the weird pulp fiction of HP Lovecraft. Call of Cthulhu had a more contemporary setting in the 1920s where D&D's ideas of class and level seemed counter-intuitive ("I'm a third level professor"?). The BRP system proved much more flexible in the simulation of more narrative-driven settings and scaffolding of more developed characters (Fig. 17.2).

While D&D remains the most popular and financially success system, there remains an open question as to which is the better design. BRP certainly matches the sensibility of more story-focussed players, yet it is more complicated and it can

Fig. 17.2 The *Call of Cthulhu* character sheet, modified image based on Peterson (1981)

be difficult to quickly ascertain a character's overall capacity or to compare her to others. D&D's strength in part comes from its simplicity and the ability to quickly know how different characters are positioned in relative power and there is definitely a more satisfying motivational 'ding' in earning a new level, than in improving a few skills by tiny increment.

In truth these design decisions have contributed to the evolution of different game cultures within the gaming community, cultures which privilege different forms of play and who sometimes take a disparaging view of the others. Some foreground character and story while others emphasise strategic challenge—both are different and not inconsistent ways of enjoying play and exploring the systems which underpin play. The early design decisions inform these cultures and facilitate the evolution and long-term sustainability of different systems. Engaging in play also emphasises the importance of system design and may have the ancillary effect of building design literacies in players who can view other systems in a more critical manner.

Both D&D and BRP have since influenced many generations of roleplaying games and video games; the purpose of this section has to point out how two different approaches to design can lead to different types of system and that early decisions can have long term consequences. One of the reasons for the popularity of the RPG medium is its adaptability, with houserules, modifications and even homebrew systems created by adherents. But these design ideas have extended beyond their initial ambition and have influenced the design of videogames as well, and further on the Xbox Achievements system discussed above.

The early design stages of educational badging frameworks will also have significant impact on the evolution of the learning cultures connected to them. A competition focussed, height-based system will have the appeal of simplicity and be easier to convey to novices, but it may not appeal to learners who are not motivated by competition. A more complex, depth based system may appeal to those who enjoy the collecting and curation of achievements but it would be more difficult to implement and may lack the motivational punch that reaching a new tier of height based systems conveys.

6 Framework Design in Video Games

The multiple connections across gaming cultures has seen tabletop RPG design influence electronic game design, first in the electronic versions of RPGs and later in other games such as strategy games and even first person shooters. In each case a game takes on the idea of a persistent portfolio of skills that a player can develop over time, making choices and gaining power based on which learning events provide the right catalyst for change.

Where electronic games have innovated over their tabletop forebears has been in the visualisation of these frameworks. By perceiving each skill or character bonus awarded under these frameworks as an individual badge, we can begin to see how technological platforms can go some way to visualise badges and the relationships between them. Again there is no direct correlation, and this is not an argument to adopt any of these systems wholesale but to look to the design ideas as inspiration in design of learning frameworks.

6.1 *Final Fantasy X(2001): Visualising the Skill Network*

The videogame versions of RPGs are more akin to strategy games than the tabletop versions but they draw heavily on existing character design frameworks. The Final Fantasy series is one of the most popular of the genre of Japanese RPGs (or 'JRPGS') which have their own tropes and fanbases, although they have been designed more for Western audiences in recent years. The Final Fantasy games tend to be sprawling epic tales, filled with weird narrative twists and unusual richly detailed settings. Where Western RPG video games tend to allow players choice in creating their own characters, JRPGs usually require choice from among a set of pre-made characters whose elaborate backstories intersect with the broader narrative.

Gameplay tends to be simpler in JRPGs with strong influence of D&D and it's height-oriented class and level focus. In this and other gameplay design choices players tend to be more passive in receiving the story as created by the developers including Final Fantasy's famous elaborate (and non-interactive) epic cutscenes.

Characters are generally defined by their professional class and level advancement occurs via the defeat of enemies, as in the original D&D model. However as the series developed, the game designers allowed players more depth-oriented choices in the details of how a particular character would develop.

In *Final Fantasy X* this took the form of an elaborate 'skill grid' from which players could purchase skill nodes each time a character advanced in level, each of which unlocked a different skill or bonus as long as it was connected to a node that was already owned. These nodes were grouped together in broad professional themes, so if a character began as a warrior it was easier for them to acquire fighting skills but it was possible to develop the character against the grain, to move them into the healer's section of the skill grid for instance (Fig. 17.3).

Even with the ornate design of the skill grid *Final Fantasy X* nevertheless remained focussed on simple gameplay as a vehicle for the grander story. Here technology did the hard work of governing the credentialing process. In game design the skill grid has been an influential innovation and for learning designers asks us interesting questions about the relationships between individual badges, learning opportunities and the ways that these can be visualised with the aid of electronic visualisation software.

As a design, the skill grid is an interesting model for evolving complexity. At the beginning a player will have only a few simple choices as to which node to acquire next, general a choice either side of existing skill nodes. But as a character attains higher levels, more branching nodes become available which creates more complicated decisions. This model also emphasises the importance of early choices for long-term character growth. Each node acquisition has only a small effect on the overall persona development, but is leading in an overall direction that has larger payoffs that rewards continued play and deeper understanding of the skill grid.

In education, we do not frequently design for choice. Learners may select programs or majors, but these are significant and largely irrevocable choices. Selection

Fig. 17.3 The *Final Fantasy X* skill grid, modified image based on Final Fantasy X (2001)

of electives *does* involve choice but all too often for students these are confined by availability and timetabling rather than legitimate learning choices. Because of its position parallel to the formal curriculum, digital badging might well form a more interactive and flexible field of engagement for learners.

A version of the skill grid has appeared in *Disney Infinity 2.0* (2014) a game designed for younger players which demonstrates that what might at first appear to be a daunting design artefact is becoming more and more natural for each generation. Learners may well become frustrated with an educational system that does not foreground choice and exploration in the same depth or with the same flexibility (Fig. 17.4).

6.2 The Elder Scrolls: Skyrim *(2011): Managing Discrete Skill Networks*

Western RPG videogames tend to take a different form to JRPGs, with more focus on player freedom to design their own character and to explore an open world rather than be pushed into narrative tracks. The cost of this can be a more generic experience, with a character less integrated into the world around them with storylines that take the backseat to exploration. The *Elder Scroll* series, of which *Skyrim* is a recent game, use fairly anonymous user defined characters but embed grand storylines and allow for depth-oriented design in a way clearly influenced by Basic Roleplaying.

Skyrim does have a height-based level mechanism and increases in level do allow the unlocking of specific character perks in a manner similar to *Final Fantasy X*,

Fig. 17.4 An example skill tree from *Disney Infinity, modified image based on Disney Infinity 3.0 (2015)*

visualised as stars in the constellations of fantasy world Tamriel, but its approach to character advancement is entirely different. Rather the earning experience points for defeating enemies, *Skyrim* draws on BRP and focusses on the use of skills as the catalyst for character change. The more a skill is used (even in some situations where mistakes are made such as failure to pick a lock) the more it develops. When a number of skills are all advanced, this triggers an increase in character level and the ability to purchase character perks, related to each of the skills (Fig. 17.5).

Here height and depth-oriented design are integrated and it is easy to quickly determine the overall level of a character (the game uses this to balance challenge levels) but the overall development pattern is set by situational learning. Videogame characters do not have the same human-mediated scope for diversity as their table-top cousins, but a *Skyrim* character can advance through blacksmithing, negotiation and crafting rather than simply relying on beating enemies in combat.

Just like the *Final Fantasy* series the *Elder Scrolls* games have evolved over more than a decade through different game technologies and platforms and early design decisions have been strongly influential on later iterations. *Final Fantasy* games foreground a pre-written story and use the system as a vehicle to engage players while the story is presented but generally do not involve significant player choice in the outcomes. The ethos of individual freedom and exploration has strongly influenced *the Elder Scrolls* games and while players have only minor choice in most narrative outcomes, they can go about them in many different ways that reward experimentation and reflection rather than purely tactical considerations.

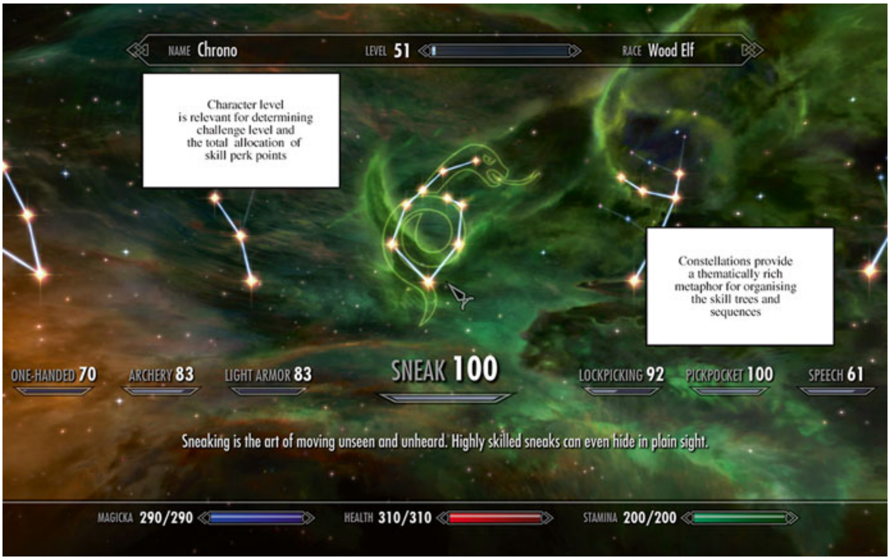

Fig. 17.5 *Skyrim* skill constellations, modified image based on The Elder Scrolls: Skyrim (2011)

The different approaches to design ask significant questions about the catalyst for change that we recognise as a learning opportunity. The D&D/Final Fantasy X approach confines these to a simple set of circumstances and in doing so privileges a particular approach to play. The Basic Roleplaying/Skyrim approach is more diverse, yet nevertheless focusses on learning as situational responses to particular challenges and carries with it its own particular ideology and values.

Likewise the ways that frameworks quantify learning are determined by particular cultural lenses and approaches to learning. The traditional grading approach is a designed artefact, a product of its time which is why it is important that the design of learning badges frameworks are products of our time and provide an alternative way of thinking about learning, valuing appropriate contexts as catalysts for change and quantifying, or perhaps a better term would be *representing*, learning in a visual way.

Both systems also emphasise the importance of scaffolding for novices and building complexity that scales with long term engagement. Skill choices in *Skyrim* can be daunting as players frequently have several different skill paths that they want explore, particularly early in the game before they have settled on an overall play style. However the system does reward experimentation and is not locked into class-based character types (everyone can learn magic or lockpicking for example). Further, the *Skyrim* system allows, even encourages, career change as a player may tire of a particular path and seek to develop skills in a different area for a while. Few education systems offer the same flexibility.

In considering the *Skyrim* skill system it is striking how infrequently education systems are designed for exploration or change. Learners are expected to commit to models of careers when they start a degree, careers that may not exist by the time they graduated and are locked into a small number of learning choices which are determined by institutional requirements rather than the learner's own personal context. The learners of today have played games like *Skyrim*, the learners of tomorrow (and some of today's learners) play games like *Disney Infinity* and these set expectations of design for interactivity, engagement and personalisation that current curriculum-based learning system designs may disappoint.

7 Design and the Future Evolution of Learning Badge Frameworks

The trajectory of this chapter has followed a wide parabola from the systems that scaffold learning badges through game design and finally back to the ongoing conversation on the design of learning badge frameworks. Without a creative and critical discourse on the design of badge frameworks there is a danger that they will simply replicate the practices of the past. The novelty of learning badges carries with it a critical mass of interest but if this it to be maintained we must ensure that the design process is robust and does not get abandoned once enthusiasm wavers.

We like to see a badge as additional motivation for learning, but what happens when the learner has ten badges, or a hundred badges? Will each of these badges alone continue to be a source of motivation? With a height-oriented perspective there might be some incentive in building a bigger and bigger total number of badges but what about learners who are not so competitively motivated, who are inspired by building a framework for depth?

In addition to this focus on design there needs to be development in the technical software layer that is to put these designs into action, which would allow different approaches of design to be included and would also foster future innovation and experimentation. In addition to issuing, displaying and curating badges we also need to consider systems that visualise the badges within their own learning ecology, allowing learners to set objectives, to share with others and to engage in an interactive manner with the system itself.

Educational badging systems are still new innovations and there has yet to be substantial exploration of depth-based design. Nevertheless it is important to consider this now as early design decisions will have longer-term effects and it will be difficult to re-orient a system that learners have grown accustomed to. Eventually, digital badging systems will facilitate the issuing and curation of badges, provide databases and analytics of learner records, automatically award meta-badges and highlight potential pathways as well as provide for visualisation of badge networks (potentially with multiple different styles). Presently much of this labour has to be done "by hand" if it is done at all. Tabletop games have done this for decades and part of the short-term solution may be shifting the burden of identity curation from central systems to the individuals who may also enjoy the pleasures of building, collecting and developing virtual identity.

This will be a significant part of the research and innovation agenda. It is also important that these innovations are driven by the open source community, to prevent innovation being seized by commercial interests the way that educational technologies often do. Mozilla placed the open badge protocol within the public arena and it is important that further development is controlled by the learning community, not locked away behind a paywall.

Part of this will involve conversations between the learning framework designers and the software designers of the platforms which are to deploy them. Fortunately the open community is usually good at making these connections. Further, we need to be eclectic in our inspiration and consider the different ways in which design can impact on motivation, in the gamification context and in the game sector itself.

Height and depth are not mutually exclusive choices. It is possible for a design framework to include both a height-oriented level system which benefits from clarity and also a depth that allows for individual diversity and choices. In these early stages of learning badges the only examples we have so far are derived from the height-oriented design of the Khan Academy, from D&D via Xbox Achievements. With time and healthy debate alternative models will emerge and will form the foundation of future innovations.

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Chapter 18
What We Can Learn About Digital Badges from Video Games

Rudy McDaniel

Abstract This chapter discusses the use of achievements within commercial video game design and development. It also summarizes research designed around specialized learning games designed to test the effectiveness of badges on learner variables such as performance and motivation. To connect game achievements to digital badges in other educational scenarios, both psychological and design factors are considered. First, connections between games research and learner motivation are discussed, especially in regards to autonomy, mastery, and purpose. Implications for measurement and assessment are considered and strategies for evaluation from prior games researchers are reviewed. Next, an overview of achievement systems within popular game environments is provided. The second half of the chapter considers best practices for designing badges as proposed by game achievement researchers. One game, *Fallout Shelter*, is discussed in detail in regards to its use of effective achievement design. Educational badge designers who may be working in game-based systems or other interactive learning spaces can use this information to build better badging systems in other realms of learning. The chapter also shares some caveats gleaned from the use of achievements in video games. These cautionary notes about achievements taken too far, or achievements that overpower other features of learning spaces, are useful to consider for using digital badges effectively in educational environments. The chapter concludes by proposing directions for future research exploring the connections between video game achievements and digital badges.

Keywords Video games • Achievements • Badge design • Gamification • Motivation • Assessment

R. McDaniel (✉)
University of Central Florida, Orlando, FL, USA
e-mail: rudy@ucf.edu

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1 Introduction

Meet Sara, a college student who loves playing video games. Sara particularly enjoys role playing games with good stories and exciting characters. After attending two classes on campus and then working an afternoon shift at the local coffee shop, Sara is tired and wants to unwind and relax. She returns home to her apartment and boots up her Xbox One game console, then spends several hours playing her favorite game, *Dragon Age: Inquisition* (BioWare, 2014). While playing, Sara follows the major plot points and completes the tasks required to advance the main story, but she also participates in several quests in order to unlock her latest achievement: *Saddled Up*. In order to earn this virtual token, Sara needs to purchase or locate at least five different mounts within the game. Mounts are rideable animals which range from domesticated horses to more exotic fantasy creatures such as dracolisks and harts (IGN, 2015), creatures which exist in the fictional world presented by the game. This goal requires Sara to focus her attention on different aspects of gameplay and make decisions that lead her in a direction connected to that overarching goal. At times, this activity conflicts with the tasks she needs to complete to advance the story, so she must temporarily pause that mission as she works to play through alternate scenarios necessary for earning the achievement. In all, *Dragon Age: Inquisition* contains 54 different achievements worth a total of 1,165 gamer points (Xbox Achievements, 2015). To earn them all, Sara will need to adjust her gameplay behavior many times and spend a great deal of time playing the game in different ways.

After playing *Dragon Age* for several hours, Sara eventually feels guilty about her coursework and decides to login to the course management system for her introductory psychology course. The instructor has placed notes, lecture materials, and study guides online for students to access. In addition, she has implemented a digital badging system that awards badges to students for extra credit activities such as writing a supplemental paper or signing up to participate in research studies associated with the department. Sara has no interest in such activities, instead choosing to complete the bare minimum of activities for the week: a brief online quiz and several paragraphs of reading presented in an online module. In this educational context, the prospect of earning badges has no appeal for Sara.

This hypothetical anecdote presents a real dilemma for designers of badging systems: why do learners care about badging elements, such as achievements and leaderboards, in one context, but not in another? Why is Sara motivated to earn digital badges in *Dragon Age*, but not in her online coursework? Further, how can a digital badge designer learn from what video games do well in order to build better badges that *do* resonate with learners and convince them to engage with learning content in more effective ways? This chapter begins to explore these questions in greater detail and summarizes research from studies of video games achievement systems that are useful in other learning contexts.

1.1 Motivation

Emerging industry trends and research focusing on gamification (Burke, 2014; Charles, Charles, McNeill, Bustard, & Black, 2011; Kapp, 2012; Kapp, Blair, & Mesch, 2014) bring renewed interest to the practice of digital badging in business, education, and instructional design. Within this context, badges are one of a variety of techniques for "gamifying" interactive learning systems through the implementation of a system for managing credentialing and reputation (Deterding, Dixon, Khaled, & Nacke, 2011) and recognizing user accomplishments. Researchers believe that gamification strategies engender positive effects within certain contexts and with certain groups of users (Hamari, Koivisto, & Sarsa, 2014), but what is it about gamification that leads to these positive effects? It may be that gamification, when effective, is useful because it reframes a learning activity from being undesirable or mundane to interesting or exciting. When considering learning interventions, especially interventions that use new technologies, it is important to think about the value added by gamification strategies.

Considering whether or not one's learners are receptive to the learning content is especially important given that motivation is one way to evaluate one's openness to learning. Sara is open to learning new ways to interact with the environment in *Dragon Age,* but she is less motivated to do so in her course management system. How does her mood and behavior change from one environment to the next? The relationship between motivation, games, and learning is complex, but in general, motivated learners are "enthusiastic, focused, and engaged. They are interested in and enjoy what they are doing, they try hard, and they persist over time" (Garris, Ahlers, & Driskell, 2002, p. 444). Burke (2014) argues that gamification is primarily successful when it increases learners' motivation by providing experiences that support three things in the player's learning session: autonomy, mastery, and purpose. In at least two of these areas, video games seem to have a clear leg up on the competition; that is, they seem better suited for establishing motivation through these means than educational badging systems.

Autonomy is about freedom and the ability of learners to "opt-in to participate" within those experiences they find most fulfilling (Burke, 2014, p. 19). In Sara's gaming experience, the game designers provided her with sufficient autonomy in *Dragon Age* by allowing her the freedom of choice within the game. Although she could choose to target only those objectives which advanced the main storyline and "beat" the game as efficiently as possible, she was also afforded opportunities for more casual and freeform exploration through the introduction of side quests and challenges, often capped with achievements. While such freedom was also somewhat present in her online course system through the optional exercises, it was also less flexible in that she was required to complete the weekly assignments and stay on schedule with her instructor and peers.

Mastery can be operationally defined as getting better at something. Burke (2014) explains that mastery is not so much an objective, but rather a journey, given that there will always be another level of proficiency to attain in challenging activities. He equates this to the mastery individuals strive for in real world activities, such as learning a new language, exercising, or following creative pursuits. Mechanisms for facilitating practice in a safe environment are essential for allowing learners to work toward mastery in a given area. As Juul (2013) notes, games are interesting because they are most enjoyable when they cause players to fail and then give the players opportunities to play better so as to avoid subsequent failure in the future. Games that do not lead players into the failure state once in a while are too easy, diminishing the opportunity for players to work toward mastery.

In Sara's case, major challenges within the game serve as gatekeeping mechanisms that need to be passed through before certain achievements are earned. For instance, certain mounts can only be acquired once a dragon has been defeated, meaning that players must be working toward mastery in combat before they can realistically earn this particular badge. Similarly, certain types of digital badges in instructional environments, such as incremental badges that can be earned and improved upon over time, offer similar opportunities for allowing learners to build mastery. However, many do not and are considered one time awards. Such badges are insufficient for creating this type of sustained learning goal for students and may be less motivating than similar systems within video games.

Purpose is achieved when players find meaning in a goal larger than themselves (Burke, 2014). This area, perhaps, is the realm in which educational badging systems may find more of an advantage over badges used in commercial video games. While certain aspects of entertainment gaming such as socializing with other players may give game players purpose in this sense, it is more likely that purpose might be found in outside activities such as improving one's education, working to enhance community, developing leadership skills, and so forth. Then again, it may be the case that the experiences encountered in fantasy environments serve broader life goals in some yet as unforeseen way. Sara may be better off having some time to relax and enjoy herself before returning to the demands of her course and its associated online assignments.

While it is true that video games do a particularly good job in providing opportunities for autonomy and mastery for their players, these technologies are useful as exemplars to consider how to focus on these dimensions when building badging systems for other types of interactive learning scenarios. For example, in regards to autonomy, one obvious implication is that non-linearity and the ability to "opt-out" of badging scenarios is likely to improve motivation for learners, at least in certain contexts. Similarly, when considering the concept of mastery, it is important for badges to be appropriately difficult to earn, but not *too difficult*. If badges are too easy, mastery is not necessary to acquire them. On the other hand, if badges are perceived as too challenging to earn, then a learner will not see them as viable and will not invest the effort necessary to work toward mastery. When considering challenge and motivation, it is useful to consider well-articulated theories of learning with scaffolding, such as Vygotsky's zone of proximal development (Vygotsky, 1962/2012). The zone of proximal development presents a model for what learners can do on their own versus with external assistance or guidance. Similarly, when thinking about badges, it is useful to consider how various game components and feedback augment a player's normal abilities. This is helpful when deciding how challenging badges need to be in order to positively influence motivation.

Lastly, while it may be difficult to think about ways in which badging systems might provide opportunities for working toward one's purpose or sense of fulfillment, it is useful to at least consider this dimension of design for building toward connected systems. For example, if community participation is important to one's values as a curriculum designer, then helping to support the community may be something that an instructor wishes for her own students to do as well. Similar badges that are carefully connected to the value systems of both instructors and students may be useful to motivate reluctant badge earners.

1.2 Measurement and Assessment

If gamification strategies potentially improve learner motivation, a mechanism is needed for measuring whether or not those strategies are working. Studies over the past two decades have established the need for sound instructional design strategies within simulations and games for learning and have noted the importance of measurement and assessment (Garris et al., 2002; O'Neil, Wainess, & Baker, 2005; Thiagarajan, 1998) as well as analytics for serious games (Loh, Sheng, & Ifenthaler, 2015). Prior badge studies carried out in video game scenarios provide evaluation feedback useful to instructional designers. Such research is useful for at least two reasons. First, these game-based studies of badges provide good ideas for instruments and measurement tools that are useful outside of games for similar types of studies looking into participant performance, engagement, immersion, or other characteristics. Second, the findings themselves often are useful for explaining how different interactive designs affect various badge scenarios operating within learning environments.

In terms of measurement tools, it is beneficial to see how video games badge researchers have used different surveys and instruments to test for the effectiveness of badges on learning performance, motivation, and other factors. For example, Blair (2011a) measured the success of various types of badges in improving performance, self-efficacy, and motivation. Blair constructed a taxonomy of achievement features which included dimensions such as expected or unexpected, incremental or non-incremental, competitive or non-competitive, and following play or during play, among many others. In his experimental study, player participants were randomly assigned to experimental (with achievements) and control (no achievements) versions of an original game called *Phone Dash*. The game was designed with simplicity of play in mind in order to be accessible to a broad range of participants. All players completed demographics questionnaires, then, throughout the research experiment, players were assessed at various points using instruments such as the Video Game Self-Efficacy Scale (VGSES), the Relevance & Usefulness questionnaire, the Game Engagement Questionnaire (GEQ), the Intrinsic Motivation

Inventory (IMI), and the TPL-KATS structural knowledge tool, which allowed players to "create concept maps or mental representations of schema" (p. 29). These instruments enabled evaluators to collect information from a variety of different areas related to participants, their background demographics, their levels of motivation and engagement while working on a task, and their use of badges in specific learning contexts.

In terms of evidence and outcomes, Blair's research provided empirical support that specific types of video game achievements improved player performance and attitudes toward the game. While the performance of all groups improved from pretest to post-test surveys, the improvement was not always significantly related to the presence or absence of achievements. The most significant gains were found in the use of a combined achievement condition, which included achievements that were *incremental*, *expected*, and *awarded after gameplay*. Those features in a combined design strategy produced a more powerful effect than each of those design characteristics in isolation.

In a later study, Fanfarelli (2014) conducted research on the impact of both achievements and narrative features on an original learning game designed to teach players about different areas of the brain. For his measurements, Fanfarelli assessed his experiment with 80 participants between the ages of 18 and 38 (40 male, 32 female) using four groups and a variety of questionnaires. Participants were divided into one of four groups: control, achievements, narrative, and combined, then given a battery of surveys both prior to and after interacting with each game condition. Some surveys, such as the Flow State Short Scale (Jackson, Martin, & Eklund, 2008) had previously been used by sports psychologists to measure the psychological notion of flow (Csikszentmihalyi, 1990) within activities in the physical world. Other instruments, such as the Game Features Questionnaire, were developed by the author around specific subjective questions relevant to the game being studied and its associated learning objectives. Participant engagement was measured through an Engagement Measure which was combined from two different questionnaires (Charlton & Danforth, 2005; Jennett et al., 2008) which collectively measured participants' effort, interest, and enjoyment in the game and its objectives.

Although Fanfarelli's (2014) work ultimately did not find a significant improvement in learning or engagement using either narrative or game achievements in his learning game, he did note that the game itself significantly improved learning of the material and speculated that the method in which his achievements and narrative components were delivered could have been designed more effectively. Such design factors are critical given that a system with ineffective feedback or cumbersome controls will be ignored by players or may even decrease the effectiveness of learning or engagement.

This section focused only briefly on two studies of game-based digital badging. Although instruments and results from these studies were highlighted, there are certainly many other things to learn from such research, including how the experiments themselves were set up and conducted and how the chosen games' design affordances impacted the reception of badges by players. However, the methods and measurement information are especially useful for future studies of digital badges in learning environments. While these studies yield interesting evidence about the impact of digital badges in video games, much more empirical work is needed to properly evaluate the impact of badges on player interactions in learning environments.

2 Badges and Gaming

Having considered the potential usefulness of badging on player motivation and reviewed some of the instruments for assessment and measurement as well as some interesting research results, it is helpful to now consider some of the ways in which effective badge design guidelines have been suggested from video game-based studies. In her report on digital badges sponsored by the MacArthur Foundation, Grant (2014) notes that despite their rising popularity and acknowledged potential for improving the recognition of learning, especially learning that happens in informal learning environments, designing "relevant and impactful" badges remains a significant challenge (p. 5). Such questions of relevance and impact have been tackled by game developers through many years of developing and deploying video game achievements within individual games as well as through out-of-game collection and display technologies such as the Xbox Live achievements system and players' "Gamerscores" as well as competing systems like PlayStation's Trophies and iOS Game Center Achievements. Before diving into the world of video game achievements, however, this chapter first reviews a brief history of badges and summarizes the major features of digital achievements systems as found in games. This allows for a better understanding of the components of these systems.

2.1 Digital Badges and Gaming Achievements

Badges existed long before modern electronic video games. Gibson, Ostashewski, Flintoff, Grant, and Knight (2013) trace their beginnings all the way back to the jewelry or symbols worn by knights, the evidence of pilgrimages worn by religious individuals, and markers of political allegiance worn by politicians. Much later, of course, badges were used in the military to designate rank and special accomplishments and were used extensively in various community and service organizations, most notably in the Boy Scouts. The original Boy Scouts of America Handbook (2009/1911), for example, features a particularly well-defined taxonomy of badges complete with a diagram showing the proper placement of badges on the Boy Scout uniform and a list of various badges and how they are earned. Within each of these contexts, the designs of these badges were carefully considered in order to effectively convey their usefulness as credentialing systems, reputation enhancers, or rewards.

Despite their lengthy history in the physical world, the scholarly literature for *digital badges* only begins in 2010, with mainstream global interest likely emerging in part due to the Badges for Lifelong Learning Competition and Mozilla's Open Badges Initiative, launched in September of 2011 (Gibson et al., 2013). However, even before digital badges captured the attention of mainstream academia, there were already commercial systems being used in the video game world. Although Microsoft's Xbox Live system and its associated Gamerscore system is probably the most well-known example, even the Atari 2600 system had a mechanism for earning achievements, such as the 10,000 point award in *Chopper Command* (Jakobsson, 2011).

In the era of contemporary video gaming, badges and achievements have been a core component of many of the most popular online services. The Xbox Live system accompanied the release of the Xbox 360 in 2005 (Lewis, de Salas, & Wells, 2013) followed shortly thereafter by the Steam achievements system for PC gamers, which debuted in 2007 (Wikipedia, n.d.-b). The PlayStation Network, which offers a similar achievements program through their PSN Trophy system, followed shortly thereafter in 2008 (Wikipedia, n.d.-a) and Apple included achievements as a core feature of their Game Center application with the release of their latest mobile operating system, iOS6, in 2012 (Hafizji, 2012). As of February 2015, Nintendo has yet to adopt and implement its own version of an achievements system (Hunter, 2015).

While game systems such as Xbox Live, PSN, iOS Game Center, and Steam each consider the particular implementation of achievements somewhat differently, they do share features with one another that allow them to be considered collectively. Lewis et al. (2013) define achievement systems within video game environments as "a shared repository for storing the possible obtainable Achievements of each game and records of Achievements awarded to all players" (p. 66). Thus the Xbox Live, PSN Trophy, and Steam achievement systems are each responsible for both awarding individual badges and keeping track of the cumulative badges awarded to all players. Lewis et al. (2013) also note that these types of systems are generally external to a specific game, facilitate sharing with other users, and are integrated as components within larger systems, such as multiplayer services, messaging systems, and purchasing functionality for downloadable content. This latter feature is likely quite important, because it means that the badging system is incorporated into a more complicated systems framework that requires ongoing maintenance and oversight. Were badges left alone as a separate module, they might be more vulnerable to being discontinued or deprecated as other features of the system were updated to newer versions.

It is interesting to note that commercial video games are ahead of the curve in some ways over other types of digital badging systems, and behind the curve in others. For example, while the achievements systems in gaming environments are visually striking and technically sophisticated, their proprietary nature often means that badges developed and deployed in one system cannot be exchanged with game players using other systems. A PSN Trophy, for example, cannot be seen by Xbox Live players, nor can that Trophy be associated with the account of a player who plays the game on both consoles. On the other hand, digital badging systems such as Mozilla Open Badges are specifically designed with portability and extensibility in mind using “an open technical standard any organization can use to create, issue, and verify digital badges” (Mozilla, n.d.). Some systems do integrate badges across hardware platforms as long as they exist within the same software infrastructure. For example, Apple’s Game Center is capable of tracking achievements earned on a variety of Apple hardware devices (iPhones, iPads, etc.) and displaying these statistical accomplishments using a single database linked to a player’s account identifier.

Such open standards have not yet emerged within video game achievement systems, although such features would likely be useful given the fact that players use different types of video game consoles and computer systems to play their games. In 2015, the top devices most frequently used by gamers to play games included PC (62 %), a dedicated console such as the Xbox One or PS4 (56 %), a smartphone (35 %), a wireless device (31 %), or a dedicated handheld system, such as the Sony PSP or the Nintendo 3DS (21 %) (Entertainment Software Association, 2015). Many gamers, of course, will play games on more than one of these systems, meaning that the achievements they earn will only be accessible from that particular device’s proprietary network during a given play session. This also speaks to the importance and necessity of carefully considered design principles. While there is plenty of real estate to deliver and display badges on a PC computer with a large, flat-panel display, larger badges may be cumbersome and distracting on the small display panel of a device such as an Apple iPhone, a Nintendo 3DS, or a Sony PSP. Thus, the diversity of gaming hardware display technologies is also something that directly impacts how gaming achievements are designed.

2.2 Design Guidelines Derived from Game Achievements: Digging into Two Achievement Types in **Fallout Shelter**

Critically observing how achievements are used in commercial video games offers a wealth of information about effective and ineffective design patterns that can inform designers seeking to deploy badges in other educational settings. Consider the game *Fallout Shelter* (Bethesda Game Studios, 2015), a free-to-play mobile and tablet-based game released in June of 2015 that quickly became a top grossing app on the Apple iTunes application store (Starr, 2015). Initially released only for iPhone and iPad devices, the game was later extended to the Android hardware platform as well. Like other games following the free-to-play business model, the core application was released for free and players purchase various upgrades through micro-transactions enabled by in-app purchasing.

The main goal of *Fallout Shelter* is to build a massive underground bunker, or vault, capable of supporting an ever-growing number of inhabitants. To keep vault dwellers alive, the player plays the role of the vault overseer, the person responsible for managing resources within the vault to keep the environment safe and secure. The overseer must create and manage different types of rooms, such as power generators, water treatment plants, and cafeteria-style restaurants, to keep the underground population fed and to supply the necessary water and electricity to various parts of the grid. In addition, the overseer makes decisions about who to send out into the wasteland to forage for new supplies and who to delegate for various mission critical exercises such as stamping out radiated roach infestations, defending the vault against marauding “raiders,” and leveling up various abilities that allow the inhabitants to excel at certain types of jobs within the vault.

While the overall reception to the game was mixed (as of June 2015, Game Rankings’ score for the game is 74.58 % and Metacritic’s score is 75 %), *Fallout Shelter* does very well in using achievements to drive gameplay in particular directions and keep its players motivated to play. There are two types of achievements used with the game. One serves as a primary game mechanic, labeled “objectives,” and displays a list of objectives within the graphical user interface that can be clicked on and viewed at any time during gameplay (Fig. 18.1). The player can view these achievements at any time and see the particular awards associated with meeting those goals. The other is a more traditional type of game-based achievement that awards badges to the player that can then be accessed through the iOS Game Center. An example of this second type, which rewards the player for constructing 50 different rooms within her vault, is shown in Fig. 18.2.

The virtual currency of *Fallout Shelter*, bottle caps (abbreviated simply as caps), is useful for purchasing and upgrading new rooms. The rooms, in turn, are necessary for balancing the vault so that food, water, and electricity remain plentiful and the inhabitants are safe and happy. At any given moment during gameplay, the player can click on a ribbon icon to see a list of three achievements and their associated rewards. For example, a player might be encouraged to “kill 19 wasteland creatures” and see a reward listed of 153 caps. This achievement is useful because it provides

Fig. 18.1 Objective-based achievements in *Fallout Shelter*

Fig. 18.2 Traditional-style achievements in *Fallout Shelter* (iOS Game Center View)

an immediate incentive for the player to send one of her vault dwellers out into the dangerous, irradiated wasteland to scavenge for caps and supplies. Once the creatures are killed, the player will earn those caps as a reward, effectively monetizing the achievement. These caps can then be spent on various new rooms and upgrades. In addition, achievements sometimes include prizes that are even more valuable than caps. For example, there is a lunchbox prize (Fig. 18.1, middle objective) that contains a set of four random cards, each of which contains valuable resources useful for gameplay. These resources may include additional units of water, electricity, or food, or even special items such as leveled up vault dwellers, weapons, or armor. The currency linked to these achievements is very motivating to players and thus the achievements are effective in shaping how players move through the experience of constructing and managing their underground communities. Although free-to-play games use this purchasing of upgrades as a tactic to make their games more profitable, this particular game is able to employ these tactics without seeming overbearing or making players to feel as though they are being cheated out of their hard earned money. In other words, these purchased upgrades are not necessary in order for the player to succeed and play the game well (Hernandez, 2015).

As the *Fallout Shelter* example reveals, in order to function as effective tools for education, badges must be designed in a way that positively influences a learning scenario. They must also be crafted carefully so as to avoid the production of negative emotions in learners. As Crawford (1984) notes, one of the primary tasks of a game designer is to consider the types of emotional responses the designer hopes to see in his players.

Fortunately, this type of thoughtful design is familiar territory for well-designed video games. An emerging body of research is beginning to explore how badges can be designed in a similarly careful and thoughtful fashion. For example, a number of studies have focused specifically on the impact of badges within video games (Blair, 2011a, 2011b; Fanfarelli, 2014). Perhaps the most accessible resource on the subject is a three part series published by Blair, whose work (2011a) was reviewed earlier in this chapter. In Blair's (2011b) follow up work, he synthesizes his research into a series of eight design recommendations, presented in a three part series on the popular video gaming web site *Gamasutra*. In the list below, Blair's (2011b) recommendations are outlined and then a brief discussion of how *Fallout Shelter* does or does not follow each recommendation is provided.

1. Use *measurement achievements*, which provide specific performance measurement (e.g., how well a task was completed) rather than *completion achievements*, which are merely rewards after a task is completed. *Fallout Shelter* does this well by providing progress bars for each achievement as a player works toward a goal.
2. Consider the range of interactions within a game as a player might consider them, from boring to exciting, and then use badges to *reward the completion of boring tasks* and *provide feedback for interesting ones*. Many of the achievements earned in *Fallout Shelter*, such as collecting a specific number of units of some resource (water, caps, food, etc.) could be considered boring, but a player's recognizing that there is a reward at the end of the experience encourages them to continue working on those tasks.
3. Make achievements *challenging* so that they are non-trivial to obtain. Many of *Fallout Shelter's* achievements, such as leveling up player attributes or merging rooms together, are challenging and time-consuming. Achievements focused on these types of tasks help direct the players toward habits of cultivating more complex play styles necessary for success as their vault population grows and the game becomes more difficult.
4. Direct players toward *performance orientation*, or a mindset which emphasizes explicit goals such as points or time to objective, for simple, repetitive tasks. Strive for a *mastery orientation* perspective, or one that allows for repeated errors working toward competency, for more complex tasks that require complicated strategies or creative problem-solving. One of the interesting mechanics used by the *Fallout Shelter* designers is to only display three achievements at a time, allowing players to work toward any or all of those objectives at any given moment, but also giving the player the opportunity to delete one achievement and have another take its place (see the x tab in each objective shown in Fig. 18.1). While such a design decision guides players toward improved performance, it also allows players to discard those goals they find too easy or pedestrian and seek more complicated goals that require additional mastery.
5. Use *expected achievements*, or achievements that players know they can earn prior to playing, to allow them to set goals and map the game space in their minds. Use *unexpected achievements,* or achievements that remain hidden until earned, sparingly to encourage playful exploration or experimentation. *Fallout*

Shelter contains a nice mixture of both expected and unexpected achievements. The objective-based achievements are both expected, in that a player can use her prior experiences of using the objectives system to predict new variations, and unexpected, in that the player does not know for sure which new objectives will come into rotation. The traditional-style achievements are entirely unexpected.

6. Give new players *immediate feedback* when achievements are earned and more experienced players *delayed feedback*. In both cases, consider the nature of the interface to determine the most effective way of providing feedback to the players. For example, does the game afford pauses or delays in between rounds of action? If so, that is an ideal opportunity to display earned achievements, such as in the loading screen found in between levels. *Fallout Shelter* does this in its objective achievements feature by providing progress bar feedback that shows up after the completion of incremental steps toward the overall goals. However, after this initial display, the overall progress bar is hidden until the player clicks on the appropriate icon to view the data. Beginning players therefore see immediate feedback and both beginners and experts can pull up more detailed feedback when they need to.
7. Take advantage of the affordances of electronic storage media and allow players to save their achievements and revisit them later if they so desire. A *stored list* system, such as a database of earned achievements, is useful for this purpose. This is interesting to consider within the *Fallout Shelter* environment. Although traditional achievements can be revisited at any time in the iOS Game Center application, the objective-based achievements are ephemeral and disappear after they are completed. However, the *genres* of potential objective-based achievements are now implanted in the player's mind through repetition, so even though they are virtually extinguished, the player still has an idea of what to expect for future types of performance-based achievements that rotate into place after each prior objective is met.
8. Consider the collaborative and competitive nature of gaming systems and allow players' achievements to be *viewable to other players*. This might encourage competition, collaboration, mentorship, or any other number of potentially desirable learning behaviors within a system. This type of guideline in *Fallout Shelter* is best met through the traditional achievements system, in which players can share their lists or challenge one another (as shown in Fig. 18.2).

While Blair's guidelines are certainly useful and are based upon empirical research using his own game study, the reality is that there are no universal guidelines that will work for all types of learning systems and all types of badge designs. *Fallout Shelter* follows a number of these guidelines, but it is also a unique case in that achievements figure predominantly into its core gameplay mechanics, a phenomenon much more likely in real-time strategy games than other genres. In other categories of games, the necessary conditions for successful badge effects are often more difficult to determine because the interaction transactions in which badges are earned are complex, involving a number of factors including the social environment, the nature of the system, and the participatory investment of the user (Hamari et al., 2014). As visible markers of performance and indicators of past behaviors within a system, badges encapsulate performance and behavioral data from a user's interaction with a system, but these systems can be wildly different from one another, meaning that the interactions are too. As such, a badge system designer needs to be familiar with a variety of psychological, pedagogical, and design-oriented principles for certain genres in order to design and develop badges with the ability to influence positive outcomes (McDaniel & Fanfarelli, 2016).

Lastly, it is worth noting that designers can learn from game achievements not only in terms of design heuristics, but also in terms of better understanding the structure of badges in general. Existing research focusing on achievements in video games helps designers better understand how badges function as both visual tokens and mechanical interventions. For instance, in regards to Blair's design guidelines above, even if his design recommendations are not universally followed, designers still have a very clear sense of the important questions to consider when designing digital badges. Here are just a few questions based on Blair's taxonomy that are useful for the design and planning process within a particular genre of interactive learning system:

1. What specific types of achievements should be used?
2. What types of learning activities should achievements be used to reward?
3. Should achievements be challenging to earn, easy to earn, or both?
4. What attitudes do designers wish their learners to have toward the learning system?
5. Should the achievements be known in advance, or invisible until earned?
6. How and when should achievement feedback be provided to learners?
7. Should learners be able to revisit achievement feedback over time, at any time?
8. Should learners be able to see the achievements earned by individuals other than themselves?

Additional studies focused on achievements in video games have analyzed in detail how achievements are constructed and which components contribute to their function. For example, Hamari and Eranti's (2011) work used a mixed methodology research design and evaluated over 1000 hours of participants playing nine games with over 700 potential achievements. Their findings additionally included expert interviews and interviews with players. From this research, they identified core components of video game achievements which include a signifier (name, visual icon, and description), completion logic (trigger, condition, and pre-requirement), and a reward. Each of these components deserves close consideration when designing and developing a badging system.

3 Conclusion: Future Directions

Video games are systems that teach players how to solve complex problems using virtual resources and their own abilities (Gee, 2003; Prensky, 2001). Designers can learn from such systems when they consider how to integrate digital badges into other computer-mediated educational learning environments. Despite their usefulness for motivating learners, educating them about the nooks and crannies of an interactive system and assessing them in between larger course milestones, there are some caveats that must also be considered. As Sara's example illustrated in the chapter's opening, it may be that learners will be interested in earning badges in one environment, but not in another. Or, as the *Fallout Shelter* analysis suggests, it may be that certain genres of video games or specific titles do a better job of thoughtfully designing badges for maximum impact. However, even in well-designed systems, there is another danger to consider, which is incorporating digital badges at the expense of other interactions.

For instance, as the humorous web-based video game *Achievement Unlocked* (Armor Games, 2008) illustrates, there is such a thing as taking badging and achievement design too far, where the micro-objectives overpower the larger goals of the system (Gidari, 2013). In *Achievement Unlocked,* the player plays a game in her browser with the goal of manipulating a small blue elephant around an environment and unlocking achievements. However, as the game's description indicates, that is the extent of the game. In other words, there is no goal other than earning achievements. The designers ask, "Who needs gameplay when you have ACHIEVEMENTS? Don't worry about beating levels, finding ways to kill enemies, or beating the final boss… there are none. Focus solely on your ultimate destiny… doing random tasks that have nothing to do with anything. Metagame yourself with ease! Self-satisfaction never felt so… artificial!" (Armor Games, 2008). Unlike in *Fallout Shelter*, the achievements earned in *Achievement Unlocked* are designed to encourage players to consider the absurdity of digital badges rather than to direct their gameplay toward specific goals and objectives.

While *Achievement Unlocked* is designed to be lighthearted and entertaining and not to take itself too seriously, the tongue-in-cheek description raises some serious points that are worth considering for future work in this area. One future research challenge is to identify the point at which badges become counterproductive. For instance, there is the potential for badges and achievements to be distracting or even damaging to learners, such as when players feel compelled to collect every achievement on a level at the expense of enjoying the experience and its broader goals. Sotamaa (2010) calls such players "badge junkies" (p. 73). Here, motivation is strong, but is likely not the type of motivation that an educator would find most productive in learning new content. This suggest that it is not always the *amount* of motivation badge designers should consider, but also the *type* and *nature* of that motivation and how it pertains to the learning objectives within an interactive educational environment.

Another future research opportunity is to continue to explore how achievements in video games relate to digital badges in other learning contexts. Video games are diverse and complex and use achievements in many different ways for many different purposes. It would be interesting to consider how a video game's genre, for example, relates to different achievement design strategies. Similarly, an in-depth study exploring how achievements are used for specific purposes; such as credentialing, exploration, or motivation; would be highly useful even outside the world of commercial video games. Lastly, one important area of future research would be to compare and contrast the design and use of achievements within commercial entertainment games versus so-called "serious" games used primarily for purposes other than entertainment.

This chapter argued that there is much to learn about digital badges from video game environments. The ideas presented here only scratch the surface of what should eventually be a much broader and deeper area of investigation. Whether considering how video games may incorporate badges for motivational or assessment purposes or in thinking about "badges gone wrong" as beset by proprietary coding or oversaturated usage, it is important to consider this genre of learning environment when thinking about badge design and implementation. While badge systems in the physical world have a long history that predates video games by hundreds of years, digital gaming systems are pioneers of digital achievements and badging. It is important for this research community to remain connected to the work of the game design and development community as educational technology designers and digital media experts continue to build better digital badges for teaching and learning.

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Chapter 19
Digital Badges as (Parts of) Digital Portfolios: Design Patterns for Educational and Personal Learning Practice

Ilona Buchem

Abstract This chapter explores the concepts of digital badges as (parts of) digital portfolios and proposes two digital design patterns for badges-portfolio integration. Digital portfolios are dynamic collections of digital artefacts including work samples, learning resources, records of skills and accomplishments, which may be created by an individual, a group, a community or an organisation. Digital portfolios can have multiple purposes, such as demonstrating learning achievements (assessment), recording a learning process (journaling) and demonstrating skills (profiling). The different models of digital portfolio practice represent different approaches to documenting, recognising and enhancing learning. Digital badges are similar to digital portfolios in that they enable learners to document and share learning pathways, learning achievements, skills and competencies. Digital badges can be used as part of digital portfolios or as stand-alone portfolios in form of badge collections. Based on the analysis of current practice, conceptual guideline for designing digital badges as (parts of) digital portfolios are drafted following the model of reflective learning design with design narratives and design patterns as a core methodology. Design patterns propose solutions to recurrent problems in particular contexts, offering a set of principles to guide the instructional designer towards a design decision. As such design patterns are models for actual design activities. Design patterns presented in this chapter are inferred from the analysis of design narratives from three selected projects employing digital badges for learning in distinctive ways. By defining design problems and design solutions related to digital badges as (parts of) digital portfolios, this chapter integrates research-based evidence and experiential knowledge of digital learning design.

Keywords Open badges • Digital badges • e-portfolios • Digital portfolios • Design patterns • Digital learning design

I. Buchem (✉)
Beuth University of Applied Sciences Berlin, Berlin, Germany
e-mail: buchem@beuth-hochschule.de

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1 Introduction

Digital badges and digital portfolios are approaches to designing learning with support of digital media. Both approaches have been applied in formal, non-formal and informal learning contexts to support, document and visualise learning processes and outcomes. Beyond education, the terms "portfolio" and "badge" have been also used outside education, e.g. financial or game industry (e.g. portfolios of offerings, badges in online games). In this chapter, the terms "digital portfolios" and "digital badges" are used to describe educational applications of portfolios and badges with support of digital media.

Digital badges, also referred to as *e-badges*, have been widely used as elements of digital games or game-based learning to represent achievements. More recently badges have been applied as elements of gamification, i.e. the use of game design elements in non-game contexts (Deterding, Khaled, Nacke, & Dixon, 2011). Social media such as Foursquare and Wikipedia have popularized badges as a way of engaging and motivating users as well as a method for goal setting, reputation building, status affirmation and group identification (Antin & Churchill, 2011). A recent development in this area is the Mozilla Open Badges initiative and the Open Badges Infrastructure (OBI) both advocating badges as open micro credentials which can be used as indicators of skills, achievements or credits for all types of learning (Knight & Casilli, 2012).

Digital portfolios, also referred to as *e-portfolios*, have been used in educational contexts to foster and demonstrate integrative and lifelong learning (Peet et al., 2011). The use of digital portfolios encompasses a wide range of approaches to supporting, documenting, assessing and recognising learning (Barrett, 2004). Digital portfolios as collections of artefacts, including demonstrations, resources, skills and accomplishments have been used to represent an individual, a group, a community or an organisation (Lorenzo & Ittelson, 2005). Digital portfolios can serve multiple purposes such as support, documentation and assessment of learning, counselling and career preparation, credential documentation and accreditation (Butler, 2006; Lorenzo & Ittelson, 2005).

In this chapter, the terms "digital badges" and "digital portfolios" are purposefully used instead of the terms "e-portfolios" and "e-badges" to reflect the evolution of media use from "electronic" to "digital". The transition from "electronic" to "digital" is related to how technologies are used to support human activity. While the focus of "electronic media" has been on using technologies to support existing forms of activity (e.g. e-mail), "digital media" focus on enabling new forms of activity, usually by converging a diversity of media (e.g. digital mailroom). This *conceptual shift in media use* has been already taken up in context of learning (e.g. a shift from e-learning to digital learning), business (e.g. a shift from e-business to digital business) and information technology, (e.g. a shift from e-signature to digital signature). The example of a digital signature may well explain the current shift in media use. Digital signature in contrast to an electronic signature codes signer's digital identity as a footprint into the document. A similar mechanism has been applied to badges. The "badge baking" process of Open Badges embeds assertion data to a badge image, thus enabling new forms of validation. An overview of literature on portfolios reveals an interesting evidence about a similar evolution of the concept from electronic to digital portfolios. While Barrett and Knezek (2003) argue that electronic portfolios should be electronic versions of paper portfolios, Eynon, Gambino, and Török (2014) frame digital portfolios as catalysts for educational and institutional change. Therefore the term "digital" instead of "electronic" is used in this chapter to emphasise the potential of portfolios and badges to promote new forms of learning and educational practice instead of operating as mere replicas of traditional practice.

Specifically, this chapter explores the *conceptual relationships* between digital badges and digital portfolios and proposes two instructional design patterns for digital badges as (parts of) digital portfolios. Design patterns presented in this chapter are inferred from the analysis of design narratives related to two selected projects employing digital badges as (parts of) digital portfolios. By defining design problems and design solutions in relation to the three uses of digital badges as (parts of) digital portfolios, this chapter integrates research-based evidence and experiential knowledge of digital learning design. The chapter is divided into five sections. Following this introductory section, the results of a comparative literature review are presented in Sect. 2. Section 3 describes the methodology of reflective learning design used to infer generalisable design patterns from design narratives. The two design patterns are described in Sect. 4. Section 5 closes with a discussion and questions for further research.

2 Literature Review

The literature related to digital badges and digital portfolios discussed in this section stems from educational sciences and the area of digital learning design. The primary focus of this review is to understand how digital portfolios and digital badges have been conceptualised so far and what key similarities and differences can be distilled to inform further research and practice. Perhaps the biggest challenge of this review has been the fact that both digital portfolios and digital badges are evolving concepts and the conceptualisations are "reflections of the used theory and, therefore, cannot be taken at face value" (Baumgartner, 2009, p. 22). Also, due to the fact that research on digital badges is still in its infancy compared to the research on digital portfolios, there is an imbalance in the scope and maturity of the available scholarly material which can be used for a comparative analysis. For this reason, the integration of knowledge about both concepts is beneficial for further research and practice. This section examines existing concepts and classifications to propose a synopsis of conceptual relationships.

2.1 Conceptual Underpinnings of Digital Portfolios and Digital Badges

The body of international literature on digital portfolios and more recently on digital badges has been growing steadily. Alongside worldwide conferences and events dedicated to digital portfolios and badges, e.g. Digital Media + Learning (DML) Conference, Open Badges Summit, International Workshop on Open Badges in Education, Badge Alliance Open Badges Research Group and Community Calls, Open Badges in Higher Education, SXSWedu Conference, AAEEBL, ePIC, ALT, a number of journals, e.g. the International Journal of ePortfolio, Educause Quarterly, The Digital Media + Learning Research Hub Report Series on Connected Learning, Stanford University, have promoted research and academic discussion in both fields. The scholarly literature on educational uses of portfolios has a longer track record than literature on educational uses of badges. Some of the early literature on portfolios dates back to the early 1990s and focuses on portfolios as tools for competence development, documenting, assessing and organising the evidence of learning (Olson, 1991; Redman, 1994; Smith & Tillema, 1998; Wade & Yarbrough, 1996). As digital badges entered the scholarly discourse later than portfolios, there is a gap in scope and maturity of research in both areas. One prominent project which has substantially contributed to the research on digital badges is the Design Principles Documentation Project at Indiana University (Hickey et al., 2014). Also, the Badge Alliance Open Badges Research Group aims at establishing a research base that reports on a variety of open badges aspects.

These and other related sources have been used to pull together a body of academic writing on digital portfolios and digital badges to conduct a comparative literature review with the aim of distilling conceptual similarities and differences. The focus of the analysis has been on the concepts itself and not on the technologies which have been used to support practice based on these concepts. The results of the review are presented below and are organised into five key conceptual similarities (pathways, bridges, agency, evidence and catalyst), and three key conceptual differences (autonomy, scope and assessment).

The first key similarity is related to the conceptualisation of digital portfolios and digital badges as records or representations of learning ***pathways***. Early literature reviews on portfolios define portfolios as “a collection of evidence that is gathered together to show a person’s learning journey over time and to demonstrate their abilities” (Butler, 2006, p. 2). The conceptualisation of a digital portfolio as a person’s learning journey over time which is used to demonstrate own abilities, directly links the concept of “digital portfolio” to the concept of “digital badges”. Especially, the concept of open badges as proposed by Casilli (2013) focuses on badge pathways which may be used to visualise the learning journey. The concept of badge pathways envisages the value of badges in allowing badge earners (e.g. learners) to create own pathways in an emergent, self-defined, peer-defined or team-defined way. The value of digital badges in this context is defined not by experts (e.g. teachers) but by learners themselves. Open badges enable learners “to connect the outlying dots that constitute lifelong learning" (Casilli, 2013). Grant (2014) also points out that badges enable creating lifelong learning pathways by reflecting flexible and modular types of curricular design across multiple organizations. The potential of digital badges has been seen in making learning visible in ways that traditional credentials have not (Grant, 2014).

As approaches to recording and visualising learning pathways, both digital portfolios and digital badges have been considered as ***bridges*** enabling and bringing together learning in different contexts, including formal, non-formal and informal learning contexts. The potential of digital badges has been seen in encouraging connections between in- and out-of-school learning, bridging differences in opportunities for learning, improving school-community partnerships and making information about student learning available to formal and informal education providers (Mozilla, 2013). Both digital portfolios and digital badges have been driven by the idea of evidencing learning taking place not only in formal, but especially in informal learning contexts. Furthermore, the value of digital portfolios and digital badges has been seen in supporting the transition from education to employment (Ferns & Bosco, 2014; Mozilla, 2013). Digital badges have focused on recognizing learning and achievement not traditionally assessed or recognized by educational institutions (Finkelstein, Knight, & Manning, 2013). The value of badges has been seen in connecting learning across contexts by making different learning context and different types of learning more significant and viable (Knight & Casilli, 2012).

The concept of ***agency*** is another element linking digital portfolios and digital badges. Digital portfolios have been conceptualised as educational tools for encouraging students to assume ownership their own learning (Paulson, Paulson, & Meyer, 1991). Especially, the approach to digital portfolios as Personal Learning Environments (PLE) has focused on the shift of control and ownership from the teacher to the learner. In this context, Buchem, Tur, and Hölterhof (2014) emphasised the importance of emancipatory approaches as opposed to deterministic approaches in portfolio practice, bestowing decision making and choice upon the learner and actively promoting sense of ownership and control, which again are closely related to the concept of agency. In context of digital badges, Casilli (2013, p. 1) points to the importance of personal agency: "Badge pathways provide people with opportunities to make decisions based in personal agency, to define steps that may seem more like hops, and to think about ways to do things that aren't sequential or even seemingly rational". Digital badges allow learners to take ownership of learning based on interests, including taking decisions about which badges to display to which audiences (Finkelstein et al., 2013; Mozilla, 2013).

The fourth key similarity is the importance of ***evidence*** of learning for showcasing skills and achievements. Paulson et al. (1991) consider digital portfolios as a story of knowing backed by evidence. Butler (2006) points out that many different kinds of evidence can be used to create a digital portfolio, including samples of writing, photographs, videos, research projects, observations and evaluations of supervisors, mentors and peers, and reflections or reflective thinking. Ring and Ramirez (2012) consider digital portfolios a stream of evidence of students achievement rather than a periodic snapshot. Similarly, digital badges envisage evidence as a key element of the concept. For example, the open badges standard is evidence-based and allows to use many kinds of different evidence such as artefacts, testimonials and documents (Knight & Casilli, 2012; Mozilla, 2013). Glover and Latif (2013) go further arguing that the evidence (demonstrating how specified requirements have been met) and the criteria (specifying the requirements for obtaining a badge) are the two significant features of open badges which allow the use of badges as portfolios. Both digital portfolios and digital badges allow for a distributed organisation of evidence. In the conceptualisation of digital portfolios as Personal Learning Environments (PLE), the evidence is distributed in different places on the web and aggregated by the learner (Attwell, 2008; Buchem et al., 2014). Similarly, digital badges may form a distributed portfolio, such as enabled by the Open Badges Infrastructure (Knight & Casilli, 2012).

Finally, the fifth similarity emerging from the review is the role of a ***catalyst*** which has been assigned both to digital portfolios and digital badges. Both digital portfolios and digital badges have been considered as catalysts for discussions about learning and for a change in educational practice. Ring and Ramirez (2012) propose to think about digital portfolios as a catalyst for reflection and discussion about learning. Eynon et al. (2014) view digital portfolios as a catalyst for a learner-centred institutional change and propose a catalyst framework for a shift to a student-driven approach to learning. Carson, McClam, Frank, and Greenhill Hannum (2014) emphasise the role of digital portfolio as a catalyst for change in teaching towards a more integrative, constructivist, and social teaching and learning approach. Similar observations has been expressed in literature related to digital badges. Jansen, Dewi, Gleeson, and Ford (2015) conclude that digital badges promote student reflection, discussion and engagement with co-curricular materials that could ultimately enhance achievement. Wyles (2013) describes open badges as a catalyst for a new learning design. Goligoski (2012) sees open badges as a catalyst for legitimising informal learning experiences, particularly in view of gaining jobs, community recognition and learning opportunities. Charleer et al. (2013) show how digital badges can serve as a catalyst for discussion using a badge board in class to stimulate and moderate discussions and a deeper reflection about learning. Finkelstein et al. (2013) argue for digital badges as a catalyst for interdisciplinary explorations, discussions and collaborations in education.

Despite the similarities, there are at least three key differences making digital portfolios and digital badges related yet distinctive approaches. The first key difference is related to the concept of ***autonomy***. The concept of digital portfolio and the literature in this field have focused on the autonomy of the learner in creating an own portfolio by collecting, organising and presenting digital evidence in a variety of media over time, for different purposes and audiences (Hartnell-Young et al., 2007). Digital portfolios have been considered as an approach to promoting independent learning through personalised learning and enhancing learner responsibility, especially through encouraging students to make use of an iterative process to self-regulate learning processes (Chau & Cheng, 2012). The concept of digital portfolios envisages them being by default created by learners. For example, Paulson et al. (1991) view digital portfolios as laboratories in which learners construct own meaning. A number of authors have emphasised that the concept of ownership is central to digital portfolios (Attwell, 2008; Buchem et al., 2014; Garrett, 2011). Attwell (2008) emphasised that the concept of digital portfolio recognises the role of an individual in organising own learning. According to Chau and Cheng (2012) the process of independent learning with digital portfolios means doing it for yourself and not relying on others for support.

In contrast, digital badges as forms of micro credentials or digital certificates are by default created by others and issued to the learner, usually as an award for meeting pre-defined criteria. The usual practice of digital badges, including the concept of micro-certificates using Mozilla Open Badges, would be based on a rather traditional model of certification, with an organisation issuing and/or endorsing digital badges to learners. However, some authors have pointed out that digital badges may be also used for more autonomous forms of assessment including self-nomination and personal portfolio development (Finkelstein et al., 2013). A number of authors have also flagged the problem of external assessment with digital badges which has been seen as a risk of shifting the focus from learning to badge-collecting and increasing reliance on extrinsic incentives for learning (Ostashewski & Reid, 2015). As an alternative approach, a few researchers and practitioners have proposed self-issuing of badges. Technically, learners could create digital badges for themselves, but as Bull (2015) points out in order for such self-issued badges to be credible some form of external validation or endorsement would be necessary. The different emphasis and starting points for the concepts of digital portfolios and digital badges, i.e. *learner as a creator or a developer* (digital portfolios) and *learner as an applicant or an earner* (digital badges), affords different educational practices. While digital portfolio practices revolve around enhancing the autonomy of the learner in driving own learning processes, digital badges practices focus on specifying criteria for obtaining a badge as well as mechanisms of trust and validation. Also, the concept of digital badges has placed the learner in the default role of "badge earner" and thus in a dependency relationship to the issuer (e.g. educational organisation). In the current practice, the learner is to a large extend dependent on the available badge offer provided by others but may in contrast create an own digital portfolio autonomously.

The second key difference is related to the ***scope***. Digital portfolios are more comprehensive and holistic in scope compared to digital badges. Digital portfolios have been defined as collections of artefacts (Lorenzo & Ittelson, 2005). Barker, Ch (2005) views digital portfolios as ever-evolving organic creations. Barrett (2000) emphasises that digital portfolios are a combination of processes (a series of activities) and products (the end result of the portfolio process). Buchem et al. (2014) conceptualised digital portfolios as Personal Learning Environments which enable learners to take charge of own learning with support of a diversity of available media. Digital badges on the other hand are smaller in scope, usually with a single digital badge representing a smaller selection or representation of learning. Therefore digital badges have been originally conceptualised as elements of digital portfolios. For example, Jafari (2004) mentions "advanced feature of artefact certification" as elements of digital portfolios without explicitly referring to digital badges. Also, a number of projects, such as "Moodle as Issuer, Mahara as Displayer", have been based on the idea of displaying digital badges as element of digital portfolios, e.g. in Mahara. Moreover, the evidence contained in digital badges works on a more granular level compared to digital portfolios, e.g. a digital badge may contain evidence related to a particular skill, while a digital portfolio would usually contain broader evidence representing a number of skills (Knight & Casilli, 2012). The potential of digital badges has been seen in accreditation for concrete, measurable skills (Mewburn, 2014). Nevertheless, a number of authors raised a question about the accuracy with which digital badges can represent actual skills (Jovanovic & Devedzic, 2014). Again, the different scopes of digital portfolios and digital badges afford different educational practices. While digital portfolios can be used as learning environments in which learners create larger collections of artefacts, digital badges have been used to acknowledge smaller or more granular sets of skills. However, "smaller" badges can be aggregated to a "larger" badge or combined to collections of badges representing learning pathways (Casilli, 2013). From this perspective, sets or collections digital badges may be used as digital portfolios in their own right.

The third key difference between digital portfolios and digital badges is related to the role and type of ***assessment***. Both digital portfolios and digital badges may be used for assessment of learning and/or assessment for learning (Rate, 2008). Digital portfolio practice has applied criteria to collect artefacts and reflect about learning, for example using the rubric and marking guidelines (Ittelson & Oblinger, 2005). The assessment, however, has not been considered as a primary goal of the digital portfolio practice. As Ferns and Bosco (2014) point out, digital portfolios practice has focused on collating and showcasing artefacts which provide evidence of skills. Kimball (2005), Smith and Tillema (2003) go further arguing that it is the reflection (and not the criteria) that undergirds the entire pedagogy of portfolios. Ittelson and Oblinger (2005) state that digital portfolios aim at enhancing learning and may be additionally used for assessment. Also Barrett (2000) and Challis (2005) emphasise that the process of constructing portfolios, not the end product, is significant to portfolio practice. In contrast, digital badges have focused on assessment and assessment criteria for issuing and earning a particular badge, possibly linking criteria directly to the evidence. In fact, assessment has been considered as the critical components of a badge system in which "there is a claim about learning and a link to evidence" (Grant, 2014). Also, Buckingham (2014) recommends to map digital badges to a set of well-recognised standards such as graduate requirements or employability skills to enhance their value within a learning community.

A further difference related to the assessment is the type of assessment provider. The discourse and practice in digital portfolios have to a large extend focused on assessment undertaken by educational institutions within formal curricula, e.g. within a course or a program (Ittelson & Oblinger, 2005). Within formal settings, the assessment in digital portfolios has been often described in terms of teacher assessment but also in relation to peer-feedback or peer-assessment in formal learning settings (Bhattacharya & Hartnett, 2007). In contrast, digital badges have advocated assessment by non-traditional institutions such as schools or universities, enabling organisations or communities from outside of the formal education system to issue digital badges, for example as micro-credentials. Grant (2014) points out that badges provide an opportunity to distribute the responsibility for assessment within traditional organisations and across providers of learning content, such as libraries, museums, after-school programs, and professional associations, shifting the assessment paradigm from authority (of educational institutions) to credibility (of professional communities). These and related differences in approaches to assessment in context of digital portfolios and digital badges afford different educational practices. While assessment with/of digital portfolios has been focused on grading rubrics and peer-feedback within formal educational settings, often using the results to evaluate the overall effectiveness of the curriculum (Ittelson & Oblinger, 2005), digital badges have advocated assessment by non-traditional providers, e.g. industry, allowing for more flexibility in deciding what and how to assess (Grant, 2014).

The similarities and differences described above are by no means comprehensive and can be explored further, for example in relation to the technical systems used to support both approaches. The purpose of the review presented above is to distill key conceptual characteristics which can be used to inform the construction of design patterns. Table 19.1 gives an overview of similarities and differences of digital portfolios and digital badges on the conceptual level.

Table 19.1 The conceptual analysis of digital portfolios and digital badges

Concept	Digital portfolios	Digital badges
Similarities	1. **Pathways**: Recording lifelong learning, learning pathways, learning journey, story of knowing 2. **Bridges**: Connecting and evidencing learning from different learning settings/contexts 3. **Agency**: Personal agency of the learner, learner control and ownership of learning 4. **Evidence**: Evidenced documentation of learning for showcasing skills and achievements 5. **Catalyst**: Driver for educational change, especially reflection and discussion about learning	
Differences	1. **Autonomy**: Autonomy to act freely, little or no constraints to start and develop an own digital portfolio and update it over a period of time. 2. **Scope**: Larger in scope, usually collections of artefacts from different learning contexts developed and documented over time. 3. **Assessment**: Supporting, reflecting and documenting learning have priority over assessment. Assessment is usually performed in formal settings, e.g. by teachers of peer students.	1. **Autonomy**: Earning badges is dependent from the available offering, self-issued badges may need some external validation to become credible. 2. **Scope**: A single badge is smaller in scope, usually related to a more granular selection of evidence created with the aim of earning a badge. 3. **Assessment**: Assessment is the absolute priority and is based on explicit assessment criteria linking a digital badge to the evidence. Assessment can be delivered in non-traditional ways, e.g. community.

2.2 Typologies of Digital Portfolios and Digital Badges

Following the conceptual analysis of digital portfolios and digital badges presented above, this section explores typologies of digital portfolios and digital badges with the aims of revealing further similarities and differences.

Typologies of digital portfolios described in academic literature may be sub-classified into typologies focusing on the ***purpose*** and the ***process*** of digital portfolio practice. While there is a larger number of typologies focusing on the purpose, there are just a few classifications focusing on the process of digital portfolio practice. For example, classification proposed by Barrett (2000) defines four types of digital portfolios as consecutive stages of portfolio development. The taxonomy proposed by Baumgartner (2009) differentiates between digital portfolios oriented towards products and processes, with process-oriented portfolios focusing on learning, development and planning. Table 19.2 provides examples of typologies of digital portfolios differentiating between the purpose and the process of digital portfolio practice.

In comparison to the typologies of digital portfolios, as summarised in Table 19.2, taxonomies of digital badges have been sub-classified based on types of stakeholders or issuers, e.g. organisation, team, community (Casilli, 2014), according to the qualities of digital badges, e.g. competency vs. non-competency badges (MacDonald, 2014), educational approaches, e.g. composite, activity-based, grade-based or hierarchical (Põldoja & Laanpere, 2014), elements of a digital badge design, e.g. content, issuer, process related categories (Buchem, 2015), or a function of digital badges, e.g. commitment and potential (Belshaw, 2015). Table 19.3 provides examples of digital badges taxonomies.

The comparison of the terms used in existing taxonomies of digital portfolios and digital badges reflects some further conceptual similarities and differences. These may be interpreted in the following way: While digital portfolios have focused on *showcasing competencies* (e.g. in view of improving employment opportunities), digital badges have focused on *encouraging achievements* (e.g. within organisations or teams). This could mean that digital portfolios has taken a more *retrospective* approach of showcasing past learning, while digital badges has taken a more *prospective* approach of encouraging achievement is specific areas. As far as similarities are concerned, both digital portfolios and digital badges have focused on demonstrating and visualising competencies or capabilities of the learner. Digital portfolios, however, have emphasised the learning process and personal development including reflection, while digital badges have focused more on activities, participation and membership. Figure 19.1 visualises the key terms used in taxonomies as word clouds created using WordItOut.

2.3 Synopsis

The comparative literature review including the comparison of existing taxonomies has revealed some interesting similarities and differences in relation to digital portfolios and digital badges. Digital badges and digital portfolios are similar as both

Table 19.2 Types of digital portfolios

	Reference	Types of digital portfolios
Purpose	Zeichner and Wray (2001)	"learning portfolios" (documents a learning over time) "credential portfolios" (used for registration or certification) "showcase portfolios" (used to apply for employment)
	Smith and Tillema (2003)	"dossier portfolios" (used for job selection or promotion) "training portfolios" (used for learning and development) "reflective portfolio" (choice of content up to the creator) "personal development portfolio" (self-directed learning, PD)
	Abrami and Barrett (2005)	"process portfolios" (showing a learning journey) "showcase portfolios" (used to show achievements) "assessment portfolio" (prepared for assessment or evaluation)
	Barker (2006)	"developmental portfolios" (documents learners improvements) "teacher planning portfolios" (used for planning teaching) "proficiency portfolios" (determining completion eligibility) "showcase portfolios" (documenting best work accomplished) "employment skills portfolios" (used to evaluate work readiness) "college admission portfolios" (eligibility for admission to college) "social networking portfolios"
	Chau and Cheng (2010)	purpose 1: develop, demonstrate and reflect on own learning purpose 2: teachers' assessment beyond standard testing purpose 3: graduates showcase competence to potential employers
Process	Barrett (2000)	"working portfolios" (focus on collecting) "reflective portfolios" (focus on selecting, reflecting, directing) "connected portfolios" (inspecting, perfecting, connecting) "presentation portfolios" (focus on respecting, celebrating).
	Baumgartner (2009)	"learning process portfolio" "curriculum portfolio" "competence portfolio" "professional portfolio" "self-promotion portfolio" "representation portfolio"

concepts intend to enhance *evidence*-based documentation and sharing of multiple learning *pathways* or learning journeys by focusing on competencies, capabilities and achievements. However, digital portfolios take a more *retrospective approach* of documenting and assessing past learning, while digital badges take a more *prospective approach* of encouraging achievements. Digital badges and digital portfolios are similar as both may be used as *bridges* to connecting and evidencing learning from different learning settings or contexts, both emphasises the personal agency of the learner and have been considered as catalysts for a change in educational practice. However, both concepts differ in relation to *autonomy*, *scope* and

Table 19.3 Classification schemes of digital badges

	Reference	Types of digital portfolios
Issuer type	Casilli (2014)	1. Company/organization badges 2. Team/product badges 3. Individual/community badges
Educational approach	Põldoja and Laanpere (2014)	1. Composite badges (completing multiple assignments) 2. Activity-based badges (based on measurable learning activities) 3. Grade-based badges (based on the grades) 4. Hierarchical badges (divided to several levels)
Quality of a badge	MacDonald (2014)	1. *Non-competency badges:* 1.1 Encouragement badges (good work stamps to encourage) 1.2 Social badges (friendship cards, or for fun) 2. *Competency based badges:* 2.1 Achievement badges (demonstration of a skill or achievement) 2.2 Skill badges (expertise in an area) 2.3 Mission badges (series of cross curricular activities)
Design of badges	Buchem (2015)	1. *Content-related categories (what the badge represents)* 1.1 Achievement badges (demonstration of achievements) 1.2 Capability badges (demonstration of knowledge and skills) 1.3 Potential badges (indicators of future performance) 1.4 Participation badges (evidence of participation, e.g. events) 1.5 Membership badges (represents membership, e.g. club) 1.6 Commitment badges (attitudes, values, beliefs) 1.7 Encouragement badges (good work stamps) 2 *Issuer-related categories (who issued the badge)* 2.1 Organisational badges (issued by university, employer) 2.2 Team badges (issued by teams, groups) 2.3 Expert badges (issued by an expert) 2.4 Social badges (issued by peers, communities) 2.5 Endorser badge (endorsed by an organisation, expert etc.) 3 *Process-related categories (how the badge was achieved)* 3.1 Activity badges (based on single measurable learning activity) 3.2 Mission badges (based on a series of activities) 3.3 Assignment badges (based on completing a single assignment) 3.4 Composite badges (completing multiple assignments) 3.5 Progress badges (based on the progress on a given task) 3.6 Grade-based badges (based on formal grades) 3.7 Level badges (based on several levels)
Function of a badge	Belshaw (2015)	1. Achievement badges 2. Capability badges 3. Membership badges 4. Participation badges

Fig. 19.1 Comparing terms used in taxonomies of digital portfolios and digital badges

assessment. While earning badges is dependent from the issuer, creating a digital portfolio is an autonomous practice. Digital badges are smaller in scope and describe achievements on a more granular level, while digital portfolios are more comprehensive and holistic. Digital badges are criteria-driven, while digital portfolios focus on reflection.

Based on the comparative analysis two types of relationships between digital portfolios and digital badges may be defined. These are: (a) a *supplementary* relation with digital badges overcoming some of the challenges of digital portfolios and becoming digital portfolios in their own right, and (b) a *complementary* relation with digital badges complementing digital portfolios and becoming parts of portfolio practice. These two types of relationships have been used to select two exemplary projects to demonstrate how the supplementary and complementary relations work in practice. The following section describes the methodology used to create the two design patterns demonstrating the two relationships.

3 Methodology

The methodology applied to elicit the two relationships described above as two distinct design patterns follows the cycle of reflective learning design model proposed by Mor (2013). The cycle of reflective learning design combines three methods of design, i.e. design narratives, design patterns and design scenarios, used to elicit and construct design knowledge. The cycle iterates through theory, design, implementation, enactment, interpretation and evaluation starting with the design narrative which represents the perspective of the designer (designer narratives) and the participant (participant narratives), moving through the extraction of generalisable design patterns on a higher level of abstraction and arriving at the framing of design claims in form of applicable design scenarios. In the design cycle model, design narratives represent individual design knowledge extracted from empirical evidence, while design patterns represent an abstracted, descriptive organisation of design knowledge derived from the analysis of subjective design narratives. Design scenarios on the other hand, represent normative designs which specify a sequence of design actions recommended to achieve a desired educational objective.

The analysis of the reflective learning design cycle by Mor (2013) reveals conceptual links to both the model of knowledge conversion by Nonaka and Takeuchi (1995), which explains how knowledge is acquired, externalised, combined and internalised through a conversion from tacit to explicit, as well as to design-based research methodology by Brown (1992), which combines empirical educational research with theory-driven design of learning and emphasises the importance of studying relationships between the educational theory, the designed artefacts and the design practice. Design-based research has been also used as an underlying methodology in the Design Principles Documentation Project, which studies the 30 Open Badges initiatives from the 2012 DML Badges Competition, supported by the MacArthur Foundation (Hickey et al., 2014).

The cycle of reflective learning design by Mor (2013) has been adjusted to match the specific context of the digital badge design. As the aim has been to elicit design patterns, the methodology applied in the research presented in this chapter did not include specifying scenarios. In the model of reflective learning design, design scenarios specify a sequence of actions recommended to achieve an objective (Mor, 2013). As such design scenarios can be developed in a next step based on the two design patterns proposed in this chapter. The two key elements of the modified design cycle are outlined below.

3.1 Design Narratives

Design narratives are a base form for *capturing design knowledge*. As accounts of critical events, design narratives focus on designing as problem solving (Mor, 2013). The aim of design narratives is to elicit a path leading to an educational innovation, starting with the description a problem, through the account of design actions taken to resolve the problem, and finally the results of user interactions with the designed artefact. Design narratives as a research methodology require the application of scientific standards and instruments to elicit reliable data and to draw conclusions from the data. Instruments applied in the research presented in this chapter are based on the guidelines proposed by Mor (2013). These guidelines have been adjusted for current research on badge design. The template of design narrative guidelines for digital badge design can be viewed online: https://goo.gl/YPoRP2. The modified guidelines focus on six elements of the design narrative, i.e.: (1) design context, (2) design challenge, (3) theoretical/pedagogical framework, (4) design actions, (5) design results, and (6) design reflections.

Following Mor (2013), the design narrative guidelines have been applied to reconstruct a specific design experience from the perspective of the digital badges designer in two selected projects. Both design narratives have been then analysed to infer a design claim, which describes how to design digital badges as (parts of) digital portfolios. These design claims have informed the construction of design patterns.

3.2 Design Patterns

The second key element in the cycle of reflective learning design by Mor (2013) are design patterns. Design patterns first introduced by Alexander et al. (1977) as a form of design language within the context of architecture, have been used in software design as general and reusable solutions to a commonly occurring problem in a given context. The Alexander's original approach in architecture aims at articulating design patterns as good *solutions to generic problems* (e.g. creating own spaces at the university campus) in order to provide a set of criteria, concepts and tools applicable to solve a given design problem. Alexander developed over 250 design patterns which together form a pattern language (Alexander, 1979). Alexandrian patterns are presented in a specific format which usually encompasses the following six elements: (a) pattern name, (b) context of the pattern, (c) description of the problem, (e) representation of the solution, (f) example of the pattern, and (g) link to related patterns (Lockyer, Bennett, Agostinho, & Harper, 2009). Design patterns can be constructed as generalisations of design narratives and read as a statement: "for problem P, under circumstances C, solution S has been known to work" (Mor, 2013). In order to derive the two distinct design patterns for digital badges as (parts of) digital portfolios, the following six elements has been used to describe both digital badges design patterns: (1) pattern name, (2) project name, (3) design context, (4) problem statement, (5) design solution, and (6) design examples.

Following the validation process proposed by Mor (2013), design features for each pattern were captured using the three core categories—Context, Problem and Solution (CPS). Design patterns were derived from design narratives using methods recommended by Mor (2013), including specification, decomposition, extraction and generalisation. Special attention was paid to theoretical and pedagogical principles underpinning the problem and the solution.

4 Design Patterns

The analysis of design narratives revealed that both selected projects were driven by specific theoretical and pedagogical assumptions about how digital badges may support learning. The same observation has been reported by Hickey et al. (2014), who extracted designed principles from existing open badges projects and identified specific practices from the perspective of "local theories". Such "local theories" could be also observed in the design narratives and are described together with further design elements in the following two sub-sections each describing a distinct design pattern.

4.1 Digital Badges as Parts of a Digital Portfolio

The first project used to elicit the design pattern from the design narrative is the Radio Active 101 Deutschland project, which is part of a larger EU project founded by the European Commission. The project has implemented educational intervention across Europe using internet radio and social media to promote inclusion, informal learning, employability and active citizenship. The project started in Germany with the aim of doing citizen radio to empower citizens of the city. The German project has partnered with multi-generation centres. The participants include older and younger people, who want to do radio but not to be trained how to do radio. Similar to Germany, the partner project in Portugal cooperates with youth centres in regions with high numbers of people at the risk of exclusion, including the unemployed and physically disabled. The inclusion and diversity approach has proved beneficial to the project as it contributed to the interest-driven participation and engagement in non-educational settings. The project has focused on micro-learning and simple, on-demand problems of everyday radio work. Learning in a team has been supported by a learning facilitator. The project has applied novel methods including digital badges to engage disadvantaged and excluded people, or those at-risk, in learning environments that offer the opportunity to develop and enhance digital competencies and employability skills valued at work (Ravenscroft et al., 2015). The project has taken a multidimensional view at learning with three dimensions: (a) topics related to internet broadcasting, (b) skills and competencies necessary for radio broadcasting, and (c) levels of expertise. The rationale for digital badges has been seen not in meeting curriculum requirements but in rewarding participants for their engagement and acknowledging the experience they gained. The project team has viewed badges as rewarding and providing orientation. The project team has been faced with a double problem. On one hand, topics related to radio broadcasting as found in books were training-oriented and not useful for team-project-based learning. On the other hand, the facilitators could observe different competencies and skills in practice but these skills were not covered by the formal curricula. What was needed was a flexible curriculum.

The design solution has been a three-dimensional *grid* with topics, activities and levels which have been implemented to guide digital badges as (part of) digital portfolio practice. In the design stage the project team brainstormed on activities relevant for internet radio and came up with 120 activities for successful broadcasting. These activities have been clustered to make the process of badge design more manageable. Designing badges has been based on the observation of facilitators. Participant can apply for a badge and the badge is used as a reason to discuss what a person has learned or what they have not learned yet and why they did not get the badge. There are three levels reflecting that someone can or has learned more, knows more and can do more. The three levels are bronze, silver and gold corresponding to the levels: (1) “basic” (what everyone needs to know), (2) “expertise” (what you not only know but also can do) and (3) “master” (what only a few people know and can do). Badges have been issued through Moodle and displayed in Mahara. The integration into a digital portfolio in Mahara has been voluntary.

The design pattern A "Digital badges *as parts of* a digital portfolio" which has been elicited from this design narrative is summarised in Table 19.4.

Table 19.4 Design pattern A: digital badges *as parts of* a digital portfolio

Design pattern element	Design pattern description
Pattern name	Digital badges as parts of a digital portfolio
Project name	Radio Active 101 Deutschland Source: http://de.radioactive101.eu/ **Digital badges as part of digital portfolios to recognise experiential knowledge and skills in team- and project-based settings using a multidimensional grid approach.**
Design context	This pattern is applicable to team-/project-based, hands-on learning settings in informal learning context. This patterns is especially suitable for educational projects aiming at inclusion and improvement of employability. This pattern is also applicable in context of university courses, e.g. in which students learn about media and/or media literacy, or to any other educational courses in formal, non-formal and informal settings.
Problem statement	Traditional training courses and resources tend to apply fix curricula in terms of topics, materials and skills to be acquired. However, it is hard to find an expression for practical skills, personal development or for something that has been learned on the fly. The challenge is to uncover the variety of skills developed in team-based, project-oriented learning settings, e.g. in radio broadcasting. Radio broadcasting is something can be best learned by doing. Radio broadcasting can be accomplished only by a team and requires many different talents, such as being a good organiser, a technician or a manager of a successful show. Learning becomes part of the process and is not focused on fixed skills. The challenge is to arrive at structured guidelines for recognising what can or has been learned in team-based and project-oriented learning settings such as radio broadcasting. The starting point is the discussion about what skills or talents learners bring, how to match them with tasks in a team or project and how to develop them further.
Design solution	The design solution is to design badges as parts of digital portfolios to help persons who need other forms of evidence which may be used for employment, career advancement or vocational orientation. Multidimensional grids are used to define and design badges. Digital badges are displayed in digital portfolios using portfolio systems like Mahara. Learners create digital portfolios, e.g. in form of a project or team journal. The grid specifies topics, activities and levels in this way making transparent what it takes to work in a specific team or project. The grid resembles a board game which visualises necessary skill sets. Badges are assigned to specific grid boxes. The grid can be used as a development tool. Earned badges are displayed in the digital portfolio and used as a starting point for reflections about the project (e.g. radio shows) and the quality of own contributions (e.g. facilitation of teamwork). Digital badges as parts of digital portfolios are used for conversations with facilitators about learning and development (e.g. Why do I deserve this badge?). Digital portfolios with badges may be used to celebrate personal achievements. In formal learning contexts students can pursue a traditional grade based on artefacts in digital portfolios and apply for badges to certify extra-curricular skills.

(continued)

Table 19.4 (continued)

Design pattern element	Design pattern description
Design examples	A physically disabled student wants to get digital badges as part of the radio broadcasting project. She takes a look at the grid and realises that she can start with a silver badge as she already has some of the necessary skills, e.g. getting the play-board and mixer right, planning and making set ups. She applies for the badge and the facilitator meets with her to talk about her skills and talents. The students earns a silver badge and displays it in her digital portfolio in Mahara. There she writes a self-reflection about the talk with the facilitator. The facilitator organises a ceremony for all students who earned badges and speaks a laudation for each learner in front of the team. The student continues with her digital portfolio and digital badges, earns four new badges for technical skills at each level and uses her digital portfolio to apply for a new job at a local radio station.

4.2 Digital Badges as a Digital Portfolio

The second project used to elicit a design pattern from the design narrative is the Supporter to Reporter (S2R) project. It is an informal learning programme focusing on sports journalism in an outside of a school context. The project started as an experiment and an alternative provision program for youth not achieving at school. Young people participating in this program have lacked some of the key communication skills, confidence and work-related experiences. Formal education did not deliver necessary skills and much of the learning was happening outside of school. S2R developed from an existing learning programme with existing users. The project did not start with badges but with the mission of the program. Learning has taken place in a work environment, sport clubs and in the physical environment. Learning has been supported by facilitators such as experts in sports and media.

The rationale for digital badges has been to recognise skills which are difficult to recognise within framework of formal education. Digital badges have been used to capture applied skills and experience which was not possible through formal qualification programs. The aim of the S2R project has been issuing badges at scale, supporting educators at assessing applied skills whilst maintaining quality.

The special challenge in this project has been not to change or disrupt the value that had been created in the program. In this context the balance had to be made between the way of recognising learning without changing the program and the enjoyment of participants. Another challenge has been recognising the ‘soft’ skills development in the program, e.g. confidence, improved communication, team working, meeting deadlines, and the range of work related experiences, linking directly to further work or training opportunities. Further challenge has been issuing badges at scale, providing tool kits to facilitators and educators, so that they can design and issue digital badges independent from a central provider. It has been challenging to provide flexibility, quality standards and consistency across hubs around the country. Local solutions has to be worked out, e.g. urban vs. rural. At the same time the national value has been built.

The design solution has been naming learning criteria and specifying outcomes to be achieved. It has been important to focus on roles rather than skill for designing badges in order to stimulate learning through practice and connect to requirements from work (industry standards), as opposed to requirements from school (educational standards). The team has experimented with questions to guide the design of badges. This however proved to be a complex process to work with, as questions needed further support. The design solution which effectively supported the aims of the project turned out to be the Badge Design Canvas[1] based on the experience of learning and visual design. The *canvas* has supported the design of badges and enhanced sharing of designs to get inspiration and understand how other organisations approach the same challenge. The visual design of badges has been driven by the wish for badges to feel special, like achievements, providing value and sense of movement (especially in sports). The visual design has applied medal symbols and three levels (bronze, silver, gold) to emphasise parallels with sports. The project has focused on integrating multimedia evidence into badges. It has partnered with the makewaves[2] community and integrated the open badges infrastructure (OBI) into the makewaves system, which enabled to host multimedia evidence and implement a *user-led design* process by allowing learners to work on the badge and not waiting for someone issuing it for them.

The collections of digital badges in form of a digital portfolio can be shown to the public. Learners can create media stories, share and publish them to the web evidencing and linking to further resources. A central badge library provides educators with an overview of badges which students are taking and see the progress in the dashboard view. It is possible to browse the library, select digital badges and include them in a learning environment. Mission makers, third party organisations and charities can create own badges.

The design pattern B “Digital badges as a digital portfolio” which has been elicited from this design narrative is summarised in Table 19.5.

The two design patterns (A, B) presented above contain multiple education elements and may be further analysed into sub-patterns and grouped together to specify design scenarios for application in practice.

5 Discussion

As educators are confronted with the complicated challenge of capturing and sharing distributed and dynamic design knowledge in education related to the design of tools, activities, social configurations, and the synergies between them (Mor, Mellar, Warburton, & Winters, 2014), design patterns can be elicited and applied as reusable solutions to educational design problem in specific contexts. Following Laurillard (2012) on the argument that teaching is a design science, the design

[1] http://www.digitalme.co.uk/assets/pdf/DigitalMe-Badge-Design-Canvas.pdf.

[2] https://www.makewav.es/.

Table 19.5 Design pattern B: digital badges as a digital portfolio

Design pattern element	Design pattern description
Pattern name	Digital badges as a digital portfolio
Project name	Supporter to Reporter (S2R) Source: http://www.digitalme.co.uk/s2r **Digital badges at scale to enable a flexible and distributed practice based on quality criteria, using badge design canvas and a learner-led design.**
Design context	This pattern is applicable to alternative provision programs or educational programs for learners with special educational needs. This patterns is especially suitable for educational projects aiming at inclusion and improvement of employability. This pattern is also applicable to team-/project-based, hands-on learning settings in various learning context.
Problem statement	Alternative provision programs for young people are often faced with a challenge of monitoring and assuring quality. Successful programs focus on the individual needs and interests of learners and enhance achievement of realistic and meaningful outcomes. As special challenge is in recognising the 'soft' skills development in a program such as increase in confidence, improved communication and team working skills. These skills however are necessary for success in further education and/or work. Since the participants of alternative provision programs are young people special education needs, often not achieving at school, badges can be designed to provide learners with credentials they can use in the future to show what they can do as a result of participating in a program.
Design solution	The design solution is based on the project-based learning methodology, especially 'learn, apply and pass on' approach. Digital badges can be designed to express 'roles' rather than 'skills' to emphasise links to work rather than school. Digital badges are issued based on the application of skills in a real world context, solving challenges and passing on skills to someone else in order to create a deeper learning experience. Passing skills takes place when learners achieved a certain level and explain or show to someone else, what they have learned. Badges are designed by facilitators using the badge design canvas, which guides the designer through the process of creation of a badge. The design solution also envisages a user-led design of badges, in which learners are given an opportunity to design own badges. Badges can contain multimedia evidence. Collections of digital badges are published in a public web space and form digital portfolios in their own right.

(continued)

patterns described in this chapter represent and communicate two selected design solutions to advance research and practice in the field of digital badges and portfolios.

Both projects and the resulting design patterns stem from the context of information learning and aim at applying digital badges to enhance inclusion and employability. In both cases learning takes place in project-based setting and is supported

Table 19.5 (continued)

Design pattern element	Design pattern description
Design examples	A young person with cognitive and communication difficulties who is at risk of exclusion from school, participates in an alternative provision program with the goal of developing skills and confidence through sports reporting. Sports reporting includes making video interviews. For journalists some of the skills include doing research, developing a positive body language, maintaining the conversation, editing reports and presenting them in an interesting way to the viewers. The young person takes on the journalist role, captures vox pops, conducts an interview, uploads the multimedia evidence and earns a silver journalist badges. The facilitators in the program make sure that criteria for earning a badge have been met. The young person continues earning badges in further categories as producer and coach, and displays the collection of badges in a public web space. This collection becomes a digital portfolio. It includes questions, edited interviews, comments on work from peers. In this way digital badges help document the learning process and may be used for reflection, e.g. learners presented their work to the educators for feedback.

by facilitators rather than trainers. These learning settings provide open and flexible environments for learning in which digital badges can be used as (parts of) a digital portfolio to document individual learning rather than scores on standardised tests. In both projects digital badges have been reported to be valuable in a number of ways, especially in relation to goal setting, recognition of learning, peer/social support and motivation. Both projects have applied different approaches to displaying and communicating digital badges. The first design patterns is based on the approach in which digital badges are added as elements to a digital portfolio created as part of a project, for example in form of a team journal. The second design pattern is based on the approach in which learners create collections of digital badges with multimedia evidence and publish these collections publicly as their digital portfolios. Both design patterns described can be used to provide a common ground for researchers, practitioners, technologists and learners to interpret, evaluate and share their practices (Lockyer et al., 2009). Design patterns can be further combined and elaborated as learning scenarios enhancing the reuse and application of patterns in practice (Falconer & Littlejohn, 2009; Mor, 2013; Rodriguez, Rifon, & Nistal, 2004).

Based on the analysis of literature and projects as well as on the reflections from the construction of design patterns presented in this chapter, recommendations for further research include: (a) eliciting sub-patterns to the two design patterns presented in this chapter, (b) eliciting further design patterns of digital badges in practice to arrive at a more comprehensive set or a language of patterns, (c) using and evaluating design patterns for digital badges in education to provide empirical evidence of their actual impact.

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Chapter 20
Badge Claims: Creativity, Evidence and the Curated Learning Journey

Kathryn S. Coleman and Keesa V. Johnson

Abstract As educators we value skills, experience knowledge in the academic discipline and our learners. We also value the role that creativity plays in developing a sense of *becoming* and how important connections and validation are in the learning journey. In this chapter, we explore the relationship between creativity, digital portfolios, and digital badges; specifically, we identify how these tools are adding *value* to learning and how they can enact action from the learner and contribute to learning across a life time. Digital badges add a significant layer to a learner's growth when integrated into the design and implementation of the learning experience. Digital badges indicate achievement, skills, and knowledge at a granular level and convey aspects of a learner's identity. According to Singer (Modes of creativity, MIT Press, 2011), "Creativity results from collecting items in one's own experience and then transforming them in a practical manner that is personal to oneself" (p. 27). Thus, Creativity allows us to see how relevant this meta-cognitive action of reflection is to making badge claims through the curation of evidence in digital portfolios. Utilizing immersive design and design thinking approaches to develop authentic contextual portfolio strategies for learners allows for c(C)reativity to emerge and allow for human centered, experiential, creative problem solving.

Keywords Authentic learning • Design thinking • Digital portfolios • Digital badges • Creativity • Curation

K.S. Coleman (✉)
Melbourne Graduate School of Education, Melbourne University,
234 Queensberry St, Parkville, VIC 3010, Australia

Deakin University, 221 Burwood Highway, Burwood, VIC 3125, Australia
e-mail: kathryn.coleman@unimelb.edu.au

K.V. Johnson
Michigan State University Teaching, Learning, and Technology,
Wills House, 287 Delta Court, East Lansing, MI 48824, USA
e-mail: keesavjohnson@gmail.com

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1 Introduction

Digital open badges make it possible for anyone to issue and earn credible digital credentials to endorse and verify evidence. A credible digital badge is a badge that contains assertion metadata fields about when, how and who earned and issued this badge. The badge earner is awarded and issued a badge for verified evidence and the 'reader' of the badge, can 'click' inside the .png image file to see the criteria and evidence of recognition. This verifiable information supports the 'claim' for the badge to different audiences and contexts for use while presenting what the badge earner knows. We are interested in the potential of digital open badges when used to verify skills, capabilities and knowledge in higher education, particularly to make learning visible through endorsement that a static digital resumé cannot. We have witnessed many resumés and not known whether or not the claims are true and hope that the candidate's referees will be able to verify and endorse the applicant's claims and evidence. Digital badges in this instance can serve as evidence of the claimed achievement, competency and or, show mastery as determined by a third party of stakeholders. When we use the term 'evidence' in relation to a badge claim in the following chapter, we use evidence in range of ways with multiple meanings. While there is evidence of achievement within the badge itself having been issued with credible criteria from a trusted network, this evidence is contained in the trusted relationship that we have with the issuer. This trust includes dialogue with the badge issuer. The issuer has warranted and verified the achievements to recognize learning, assessment and/or extracurricular experience. There is also optional evidence linked to the badge in the metadata that signifies what the earner has demonstrated in the claim and provided for assessment of the badge claim. This proof of application is what we will further explore and believe lies in the development of curated digital portfolios.

This chapter was triggered by both author's practice as learning designers, research and approaches to assessment for learning, and as learning. As learning designers, we develop and design creative approaches to learning, teaching and evidence through assessment alongside disciplinary experts and educators. We design each learning journey and opportunity for learners to engage and be engaged in the learning process through a range of experiences. As Koper (2006) supports, "the key principle in learning design is that it represents the learning activities and the support activities that are performed by different persons (learners, teachers) in the context of a unit of learning" (p. 13). Our learning design models and strategies may differ from discipline to discipline and academic to academic, however, one thing that unites our approach is an immersive design. This model is utilized to develop authentic contextual portfolio strategies for learners where appropriate. This collaborative design approach allows for creativity and creative practice to emerge and allow for human centered, experiential, creative problem solving to enable the evidencing of learning.

In the chapter, we will explore through our lenses as both educators and designers how our belief and value in skills, experience and knowledge in the discipline and our learners can be validated and recognized through evidence based badge claims.[1] We will also discuss, value and the role that c(C)reativity plays in developing a sense of self and how important connections and validation are in the learning journey for learners in any level. Focusing on the lens of the learner in human centered design and design thinking, this chapter will further explore the opportunities and potential of digital open badges to create new learning opportunities and recognition of achievement through creativity, evidence based learning and curated learning artefacts. We will explore pedagogy and learning design through the lenses of design thinking, disruption, authority and learner engagement in this post-MOOC[2] world where we feel we can spotlight learning design and creative teaching as important indicators of change. The chapter will conclude with an exemplar scaffold or framework for designing new learning models for utilizing digital open badges and digital portfolios to curate and evidence learning for a range of audiences. This framework will allow the learner to choose from different learning pathways and evidence learning through a range of curated artefacts that fulfill the requirements set by the teacher in the badge claim. This framework can aid in preparing learners as they develop skills in producing and designing portfolios of evidence. This evidence can then, form the basis of proof against a claim for badges. When designing learning that includes evidence and recognition, we can support both educators and learners to present evidence of the many skill sets required to live a productive and meaningful life.

1.1 Designing Digital Open Badges Using Learning Design

Although the models for learning designers have been tried and tested, many have sought more design based models (Gibbons & Yanchar, 2010) to ensure relevant and real world pedagogy, and technology alignment. As learning designers and educators we seek to define and apply the art, science and philosophy of design and translate the learning theories of experiential learning, connectivism (Siemens, 2005) and constructivism (Parker, Maor, & Herrington, 2013) to new forms of learning design: evidence based digital open badges. Changes in our approaches to learning and curriculum design have been highlighted in the recent learning and teaching environment as we begin to create more personalized, adaptive and modularized learning experiences. There are many reasons why our field has been significantly altered post-MOOC; internationalization, greater learner choice, the rise of the rock star academic (Allabarton, 2015), continuing rising tuition fees globally,

[1] A badge claim is an application of evidence to demonstrate competency, achievement, skill or experience to a badge issuer. Making a claim for evidence of award can be done in a number of ways, for instance a claim may be made in formal or informal learning spaces against a designed set of criteria on a rubric or self issued with claims of evidence that are endorsed by key stakeholders.

[2] Moving into the Post-MOOC Era (Brown, 2015) Found at: http://www.educause.edu/blogs/mbbrown/moving-post-mooc-era

reified graduate employability and badges in the form of credentials that continue to disrupt current business and funding models in education. This long list is a reality and not purely rhetoric with research conducted into how ‘learning and assessment have become more granular’ (Grant, 2014), ‘Competency-based digital badges’ (Bull, 2014a, 2014b), ‘open badges and evidence’ (Ravet, 2014), ‘showcasing the co-curricular’ (Ambrose, 2015), and exploring the opportunities of ‘badges and employability’ (Hickey, Willis, & Quick, 2015; Oliver & Souter, 2013).

These factors alongside changes in practice and pedagogy, toward learning centered assessment, technology shifts and modes of delivery, learning analytics, flipped learning, video based tutorials, personalized learning, increasing social pedagogies and student feedback modes have all created a climate for change. A climate where digital open badges can thrive and act to form a new learning currency for all stakeholders to trade in. Where the stakeholders are defined, and inclusive of the learner and the choice of path they take within their learning journey. This is where badges can become both a meaningful and credentialed element of achievement for the learner.

Assessment as learning principles are ripe for badge design, as Flood (2013) purposed, we are in a time when we should be designing “learning for future adaptability: we must ensure that we are not holding fast to our students expecting them to perform tasks that are no longer relevant to their ongoing development. Our assessment methods need to be designed to identify to our students what they need to know” (NPN) through authentic and real world learning opportunities. Designing more authentic (Herrington & Oliver, 2000; Herrington, Reeves, & Oliver, 2010), and evidence based approaches (Bull, 2013) to assessment include designing learning through aligned learning outcomes to assessment and real world skills, improving students learning, engagement and participation, providing clear and explicit information to all stakeholders, accountability, validity and credibility. To achieve this, one pedagogical approach that supports both social learning, experiential and evidence based learning for badge claims are digital portfolios.

Designing a course where all tasks are seamlessly aligned and integrated to ensure that students are playing an active role in all aspects of the learning in the portfolio is advocated by Pelliccione and Dixon (2008). This framework or scaffold for portfolio design is supported by over a decade of portfolio research and practice for personalized learning and impact (Chen & Mazow, 2002; Eynon, 2009; Huber & Hutchings, 2004). Approaching digital badges in higher education with a similar framework highlights what a student can do for a range of stakeholders through *verified* evidence in the portfolio that is aligned to learning outcomes and integrated throughput a course or program. Considering the type of evidence curated in the ePortfolio necessary to award and issue badges is an important design consideration, that of indirect or direct evidence. Direct evidence is where a student collects and curates artifacts in the portfolio that display and demonstrate a range of knowledge and skills. Learners apply for badges by making a claim against the criteria and standards with this curated collection of evidence. A badge may be identified as indirect evidence when a student is awarded a digital open badge for participating in an event, achievement or demonstration of competency. A badge as indirect evidence may also be included in the claim as direct evidence.

2 Creativity, Digital Portfolios and Creative Learning Design

Learning is part of human existence. We are all born with the ability to think creatively, and fostering this creativity is the goal of education. For creativity to thrive, many have argued about the role of environment, modelling and scaffolding. Allen (2015) defines a number of ways to support creativity in the learning process:

- “Providing exemplars and analyzing their practice;
- Providing formative feedback in the form of critique on creative work, and encouraging students to critique each other’s work;
- Modelling creative behavior by teacher and/or other students” (p. 20).

As Allen presents, creativity requires certain strategies and environments to allow the creative identity to express itself. Csikszentmihalyi (1996) believes that this environment is a social one and “creativity should be ultimately linked to social contexts, and be understood by the interaction processes” (p. 144). If we consider that the personalized learning path is a manifestation of the acknowledgement of what interests the learner, digital portfolios offer a personalized environment to design, compose, reflect and curate evidence of this journey. As learning designers, it’s our ethical duty to create different paths and provide opportunities for learning journeys. It is our duty to help shape an ecosystem that is designed to continually intrigue the learner’s desire for more knowledge. The more immersed the learner is in that environment, and the more that represents what they will be doing in the real world the more effective the learner will be. As Pagano (2013) states, as learning designers, “anywhere that people are learning, we have an opportunity to design their learning experiences” (p. 7).

Traditional ‘e’ Portfolios have a long history in higher education for assessment (Mason, Pegler, & Weller, 2004; Pelliccione & Dixon, 2008), reflection (Cambridge, 2007, 2010; Polly, Cox, Coleman, Yang, & Thai, 2015) and exemplary work in showcase folios for lifelong learning (Chen, 2012; Sims & Woodley, 2011; Yang, Coleman, Das, & Hawkins, 2015). For over a decade, we have witnessed digital portfolios gaining prominence in professional disciplines which demand evidence of attainment of standards across a range of capabilities such as the Health Sciences, Education, Business and Medicine. Digital portfolios are composed of a range of multi-modal digital artefacts that are curated and composed by the learner. This *curation*[3] provides insight into the learner’s *claims* for learning. A curated portfolio is created through a range of modes and media (Coleman, 2015) and can include examples of writing, images, audio and videos. As digital portfolios have grown, the need for the deployment of tools such as digital portfolios in the Learning Management Systems (LMS) to support career development learning in higher education has

[3] Curation is an action. “A curator is a planner, designer, creator and maker of and in spaces that represent a genre, theme, narrative, story, life and invite discourse as they direct an audience for a purpose” (Coleman, 2015). The act of self-curation in a portfolio entails selecting artefacts that reflect this common purpose, dependent on the context, theme or aim and presenting it for an audience such as an assessor, employer or for the self.

flourished. This opportunity to allow students to clearly see and make the connections between their disciplinary knowledge and their future careers for themselves and future employers in a multimodal narrative is a marked change of purpose. In addition to digital portfolios, we have witnessed the use of many more E-Systems or digital spaces as portfolios such as blog-folios, professional portfolios in LinkedIn and presentation folios such as Wix (http://www.wix.com), Weebly (http://www.weebly.com/) and Medium (https://medium.com) shift and alter these forms of presentation. Any form of digital portfolio such as these mentioned, have the potential to provide a platform for holistic development and to evidence a range of skills, capabilities and learning both academically and socially for a range of audiences, both internal and external. As digital portfolios are designed, composed and curated by the learner they play an active role in developing lifelong skills of reflection in action and on action (Schøn, 1983) through the selection of artefacts that when curated present as evidence. These artefacts are purposefully selected and reflect the purpose when curated to present and demonstrate an accurate portrayal of abilities, knowledge and experience. Digital portfolios are found in many areas of education from K-12 and tertiary learning and range in purposes from showcase, learning and assessment to career and employment and for *evidencing* graduate outcomes and capabilities.

Digital places that enable a learner to curate and present skills, experiences and knowledge offer places to develop a range of digital literacy, critical thinking and problem solving skills. Digital portfolio spaces allow for learners to present their knowledge, skills and experiences while moving from novice to expert as well as shifting identities. If we think of these digital spaces as folios of evidence, it is possible to see how an 'e' Portfolio contains many claims to learning that require validation. Badges can *validate* these claims for a range of stakeholders. In Instagram for instance a student may present their photographic skills and lived experiences, in a space such a Medium they may be writing and sharing narratives, in their LinkedIn space they may presenting the professional face through lived achievements and endorsements. When amalgamated and curated in one place, these spaces change their meaning through reflection on selection and curation. Through composing a new place in the portfolio from a range of spaces and artefacts for instance, the curator demonstrates metacognitive skills through creativity. Curating and composing these spaces with purposeful selection of artifacts provides an opportunity to present direct evidence that reflects how the learner has developed metacognition (Flavell, 1979) through reflecting on reflection. "Because metacognition plays a critical role in successful learning, it is important to study metacognitive activity and development to determine how students can be taught to better apply their cognitive resources through metacognitive control" (Livingston, 1997, NPN).

A digital learning portfolio enables learners in all aspects of a learning program to collect and curate evidence of self in a range of digital places. A learner may choose to design one portfolio that integrates and amalgamates a range of spaces in one place. These connections integrate and transform knowledge as the portfolio owner refines their identity and presents themselves in a new context through one lens. The curated collection or 'amalgamation' aids in developing the meta-narrative reflection skills to present themselves for graduation as capable graduates in the discipline. Portfolios offer a place to move from learner to professional and re-present the self and offer a space for "creative becoming" (Allen, 2015, p. 13). Allen refers to this 'creative becoming' as the development of a "critically creative disposition in students and teachers" (p. 12).

When we discuss eportfolios or digital portfolios in this chapter we are referring to a *space* that:

- Provides evidence of a student's learning in the course and program through selected and purposefully curated artefacts;
- Provides examples of both formal and informal learning activities in the course and program, lived experiences and achievements;
- Is learning-centered, student-owned and managed as a personalized place that integrates a range of spaces that serve as direct evidence to other audiences;
- Is a presentation tool that is composed and curated for a range of audiences, purposes and contexts.

As learning designers, the benefits to learning for students using digital portfolios include:

- A personalized place for learning to see a narrative of learning.
- A place for students to see connections between learning experiences in formal and informal spaces integrated with their lived experiences and achievements.
- A transformative space to reflect on the learning processes and how the product progresses over time.
- A space to critically reflect and engage with learning processes on and in action.
- A place to gain and develop self-efficacy, self-evaluation skills.

When applied to digital badges and badge claims, portfolios enable a learner to:

- Display digital and open badges as artefacts curated in a collection.
- Represent pathways, incentives and recognition of waypoints in the learning journey and narrative.
- Make explicit connections between learning experiences over time.
- Have evidence validated, endorsed and verified by contextual stakeholders.
- Be recognized and verified for evidence, both direct and indirect.
- Receive credit for gaining and developing self efficacy, self-evaluation and metacognition.
- Evidence competencies, skills, achievements and knowledge for a credential.

This shift from evidence for self or assessor to recognition and validation as a credential, values the role that creativity plays in developing a sense of *becoming for the* [*l*]*earner* and how important integrated connections are in a transformative learning journey. Digital badges add a significant layer to the portfolio and to a learner's growth when integrated into the design and implementation of a learning experience. Curation of artefacts in digital portfolios for evidence in a badge claim extend the meta-cognitive action of reflection for the curator to an audience (pre-determined by the assessment or curator). Utilizing immersive design and design thinking approaches to develop authentic contextual portfolio strategies for learners in higher education allows for creativity to emerge and for human centered, experiential, creative problem solving to evolve.

2.1 Designing Digital Portfolios and Digital Badges

As we have explored, "digital portfolios are a space for creating an identity (as a student and as an emerging professional) that links the experiences of the traditional or formal curriculum with the pedagogical and co-curricular experiences that engage and transform learners" (Bass, 2010). Because digital portfolios are curated, they can demonstrate applied learning while making learning more meaningful and making new learning connections.

Design thinking is an instructional design method that asks educators to gather opinions and views of all stakeholders through brainstorming and prototyping to create a human-centered learning design environment. "The intent of design thinking is for participants to learn their way into a solution by understanding the needs of those who will ultimately use the solution being designed, brainstorming and prototyping ideas, and revising until a final product or model is established" (Warman & Morris, 2014). This brainstorming and feedback mechanism is a contribution that adds to badge design and development in education, and seeks to explore the potential of incorporating creative teaching and learning into the ecology. According to Singer (2011), "Creativity results from collecting items in one's own experience and then transforming them in a practical manner that is personal to oneself" (p. 27). The way a system is designed is the way it will be accepted, therefore, design thinking focuses on "creating innovators rather than any particular innovation" (Warman & Morris, 2014, p. 2). We believe that there must be a deep understanding, partnership and collaboration with all involved stakeholders when designing learning for digital evidence based badge claims to create a true authentic learning experience.

Designing authentic badge claims can support badge earners to contextualize, integrate and apply their learning in formal and informal experiences. Authentic learning is assessed under real-life conditions or situations. Co-designing an endorsement from disciplinary experts, employers, professional bodies, and experts in the field is one strategy for the learning design. Other learning design strategies include:

- Co-designing real world professional learning experiences that recognize and credit experience and skills with employers,
- Designing ill-defined experiential learning for badge claims that warrant portfolios of evidence endorsed by industry professionals,
- Creating complex sustained problems over time that require application of disciplinary knowledge and skill set to problems designed by potential employers and discipline experts,

- Designing an integrated portfolio assessment that requires demonstration of interdisciplinary expertise with disciplinary knowledge applied across a range of areas.

An ePortfolio of evidence, submitted for assessment of a badge claim for any of the above examples requires a range of capacity building skills for potential earners. The learning design considerations would include teaching 'Folio thinking' (Chen, 2012).

A folio thinking approach enables students to:

- "*integrate and synthesize learning*,
- *Enhance self-understanding*,
- *make deliberate choices in their learning career*,
- *Develop an intellectual identity*" (p. 7).

If we consider a digital portfolio to be a 'determination piece' of learning that a student can defend, share, and reflect upon, a digital open badge can serve to credential this collection through endorsement. This endorsement is dependent on audience and context, however, it alters the purpose of the portfolio from a curated collection of unwarranted artefacts, assessed, graded and often discarded, into a warranted and verified piece of evidence that supports a claim for learning that is life wide. To achieve this, there must be a deep understanding, partnership and collaboration with all involved stakeholders, including learners when designing evidence based digital portfolios for badge claims.

3 Immersive Design and Motivation

Due to the new landscape of learning, with new technologies and approaches such as mobile learning, transmedia storytelling, design thinking, augmented reality, alternate reality games, 3D environments and holograms in the near future, immersive learning has now become a major method for learning designers in the new frontier. No longer as designers can we operate within the "brick and mortar" of traditional academic learning, we now design beyond providing the basic acquisition of knowledge into shaping a learning experience for future creative thinkers and innovators. Yet, how do we jump from this new form of learning to another? How do we leverage these new tools within the blurred state of what's real and what could be? How do we move the informal learning principles of education where it's more about the experience and the choices you make to create a learning environment that's holistic and addresses the learner as a human being?

Now is the time to not only leverage digital opportunities and disruption to create optimal learning environments for learners. It is time for designers to create spaces where we cultivate the creativity in people. The landscape of learning is currently shifting as more humanistic models of learning are helping to shape our course. In order to keep up within this shift, "we have to "reimagine our thinking" of learning to meet the new demands of a new era" (Root-Bernstein & Root-Bernstein, 1999). Digital technologies allow us to create these opportunities for learning with no barriers, but as designers we have to create principles that allow our learners to practice in context. It's through utilizing the spaces within immersive learning where digital badges and portfolios become one of the many tools of learning to help shape learning in its new form. Pagano (2013) establishes a basis for immersive learning characteristics:

- Realism: The extent to which the environment in which you are immersed is lifelike;
- Achievement: The mechanism by which success toward performance goals is measured within the immersive learning environment; and,
- Presence: The extent to which the learner feels like they are connected or present immediately within the immersive learning environment.

It is within these achievements that digital open badges become an element that continues this immersion that can capture real world skills. As Pagano (2013) states, "achievements may take the form of high scores, badges, leveling up within the environment, or other means of special recognition." (p. 18). Would this be called gamification? Or is it a new environment created that is built upon a new creative view where learning can be optimized? As learning designers, it is our responsibility to create an authentic practice in as many learning opportunities as possible. This authentic experience is created by immersing the learning in meaningful practical experiences that draw out creative thought. Digital open badges are a tool to drive learning, an artifact, evidence of the learning process and endorsement of the claims. Badges can help to intrinsically motivate the learning, but only if the learning ecosystem is designed with other elements of authentic learning taking shape. If a digital open badge is used without shaping the total environment it is only used as an extrinsic element that will only focus the learner on a direct skill instead of a collection of stories that can be utilized as a tool of motivation to share of the total learning journey.

The design of learning experiences is key to how we learn and introduce the elements of immersion. Immersive design takes a collective thought and practice where the designers create the learning experiences by going through it themselves while creating. The experience is mimicked closely through the design process and the process that helps bring the creative abilities out within the design team is also the experience that helps shape the learning. Immersive design enables learning environments to be created utilizing aspects of design thinking (stakeholders, non-linear approach) through story driven media (immersive learning). Storytelling is a conduit that helps shape the experience which connects the dots in the learning process. Learning designers seek to develop the experience of learners, from their perspective. Portfolios as tools of evidence, provide a space to achieve this as the learner is asked to narrate and curate a claim.

If we consider that good storytelling and narration helps to create an experience for the learner; we should look more in depth at the art of transmedia storytelling (Pratten, 2011) as a learning design model for designing experiences that may lead to badge claims. Transmedia storytelling can allow the objectives of course content to be viewed in an experiential nature and the learner can participate in the learning process in an organic way. A transmedia storytelling experience can be broken down into four components (Fig. 20.1):

1. Importance of the narrative—How important is the story to the learning experience? What degree of authorial control is there?
2. Importance of participation—How important is it that the audience contributes to the story-experience?
3. Importance of the real world—How important is it that the story-experience pervades real locations, places, events and people?
4. Importance of gaming—How important is it that the audience has a goal or must achieve or collect something?

In order to share a compelling story, a shared experience at least one or two factors must be present in order for the experience to be meaningful. As we know digital open badges are not a one size fits all tool, they are different in each context and eco-system in which they are designed. When used in a gaming experience or simulation they may serve as digital badges. The action of the badge is to serve as a marker of waypoint in a journey for the learner not as a credential, but rather as an indicator of self.

As learning designers moving forward we have a plethora of learning tools to set a stage for creative transformation. Transmedia storytelling is one tool as well as digital badges and portfolios that can be used to create an immersive experience yet it cannot be the only tools utilized. The new era requires many tools as Root-Bernstein and Root-Bernstein (1999) stated, "tools for thinking" is required to help bridge the gap between what is and what isn't to create understanding. Yet it's within digital badges that achievements can be shaped vs traditional assessments that test knowledge beyond basic acquisition. We shall talk more in the latter sections how badges and portfolios can be used to synthesize information when learning. Our academic frame of reference needs a reshaping that embodies our

Fig. 20.1 Anatomy of a transmedia experience. *Source*: Getting Started in Transmedia Storytelling, transmediaStorytelling.com

cognitive and creative understanding of ourselves. "If we fail to understand creative thinking, we cannot hope to have an educational system that will produce creative individuals" (Root-Bernstein & Root-Bernstein, 1999, NPN). If we continue to exist as a society that marginalizes the creative thinker, innovation will only exist in recreating the norm with new tools. There has to be an incubator of learning taking shape in academic thought that not only continues to question yet takes the leap outside what our society's currently molds as the twenty-first century work force of the world. As designers, writers, scientists, musicians, activists, inventors, and engineers think and create the most exquisite works of art that display an internal learning path that help inspire as well as transform lives so must the academic. The only failure that can come about is not to create a new ecosystem despite the odds of traveling the road less traveled. Following are two brief case studies that take a leap in collective creative thought taking place leading the way to creation utilizing digital badge. There are many more we would like to share yet these two take enormous steps in trail blazing new paths in reimagining new learning paths. They are simply described here to demonstrate the point and offer an insight to different ways designers and educators are using creative thinking as a means to an end from a holistic perspective for the creators and the learners using elements of immersion with not set roadmap:

Case Study: 1: Shaping Creative Thinkers Through a Multidisciplinary Approach—*A College Course*

A practical example of applying transmedia storytelling is taken from the international online newspaper, the Daily news. The daily news ran an article that listed the top 10 unique college courses in the world. The model of this course is transfigured to utilize badges and portfolios as "achievements" within the course simulation using design thinking. This course takes transmedia storytelling, participation, power of choice, intrinsic motivation and gaming to create a meaningful learning experience. Within this experience learning is built upon by the choices the learner makes within the game-like simulation. These choices turn into 'achievements' through deep self-reflection, both personally and within the group dynamics that are then represented by awarded digital badges. At the completion of the course the students are recognized by sharing their learning experience through a curated digital story (portfolio). Digital badges in this instance, are a useful artifact for the learner that they can share with audiences to demonstrate their experiences of the different skills they have acquired in the course, not only through the reflection but through extension of sharing their badge through their portfolio. The badges in this example are not credentials, rather signifiers of achievement. This example demonstrates how the design of a learning ecosystem was created with the use of storytelling, gaming, self-reflection, and activities that enabled the learner to develop skills that they would utilize within the course as well as outside of the course to be indicated by the digital badge.

Case Study 2: Creating an Ecosystem from the Unknown—*Informal Learning Spaces*

Detroit Public Television (DPTV) is currently in its second phase of creating an ecosystem for Detroit area non-traditional learning programs. Its overarching goal—to utilize digital badges to help area learners gain exposure through informal learning experiences. Digital badges are the conduit for over 25 programs ranging from Bat ecology, gardening, and museum learning. The first phase was to get as many programs on board to participate in the study and utilize a tier system in providing the weight of badges. Many of the programs took a significant amount of time to restructure or retrofit their programs in aligning with state or national standards for recognition. The 'outside' of the digital badges were not designed to look aesthetically pleasing. They were designed to provide a litmus test of the leveling up of learning or progression that can be demonstrated so the learners can share their experiences with each other and a range of stakeholders, who could recognize through basic color changes and iconography visually what was happening. A steering committee was assembled to help guide the focus that consisted of corporate entities, several universities within the state of Michigan, local non-formal learning institutions, learnings, as well as learning designers are currently engaged in this new phase where connected learning environments will be bridges and shared to help document progression through the 3-tiered learning mechanism documented for this mass experimentation. The lead project manager who is an education coordinator identified three main advantages of utilizing informal learning institutions to create this ecosystem:

1. The ease of use of politics
2. The conviction of the institution to utilize innovative practices
3. The level of passion of the participants who were creating the ecosystem

This is where designers, administrator's academics, future students, admissions counselors, and workforce employers are needed to help create a space for the digital badges to become meaningful as well as the participants input through the learning experience. The road map was not designed, it was decided that through the design process, that where the unknowns become less fuzzy and experiential, that learning practices can be transposed to lead the light of the path through ideation. This new experience of creation has to have designers and design practice at the center to help lead the way. We are in a new era. It's time to embrace this entrepreneurial spirit through learning with authentic learning experiences that motivates the desires within every living individual.

4 The Curated Learning Journey

Learning in this new world should reflect the fluidness of the learning that takes place within natural settings. As Fiol and Lyles (1985) suggest, a definition of learning as the "development, insights, knowledge, and associations between past actions, the effectiveness of those actions, and future actions" (p. 11). Designing and creating an ecosystem that allows and affords for creativity, deep reflection, and critical thought should be the main focus of all stakeholders involved. The overarching goal should be for the learner to be able to share, demonstrate, and test their knowledge within any framework or approach. So reflecting how the badge ecosystem can be developed to fit with the learning and how it can be reflective like a mirror on the learning is imperative in the design process. Each approach to this model should be viewed within the formal and informal learning patterns for the student, at all times reflecting and mirroring the learning opportunities. Badges can become a natural element within the learning ecosystem if well-designed to allow learners to be motivated to learn both intrinsically and extrinsically, for themselves and their growth—not purely for standardized assessment.

4.1 Designing a Curated Journey

The design of any portfolio or badge learning ecosystem or journey should ideally be backward designed in order for the badges and the learning to be mirrored in a meaningful way. Determining the skills, knowledge and experiences that the learners will acquire and demonstrate as evidence of learning that is to be verified and endorsed is an important defining phase of the design. When designing learning environments for portfolios and digital open badges the final product or curated place is the context for the design—the challenge or problem. Design thinking as a process, combines idea generation through empathy and creativity to generate new ideas and designs needed for new environments. To design a curated journey in a course, the process follows an iterative and cyclic pattern, rather than a clear linear process that is focused on the problem at hand, driven by empathy and the needs of learners. It is iterative and moves back and forward between idea generation, ideation, incubation and testing to ensure that the design is refined and tested along the way. When designing a learning journey that culminates in warranted evidence, the design process should involve as many team members and stakeholders as possible. The process should also be explicit and clear at all stages as the design is generated and incubates, be tested through prototyping and, ultimately builds the competency and capacity of all stakeholders. Capacity building is an important aspect for disruptive technologies such as digital open badges to add value and credibility in the networks that design, issue, endorse and award them.

To begin the backward design, as a team begin by asking yourselves: What will the learner need to know? What artefacts and evidence will be generated? When and where will it be housed and presented? What type of portfolio is being designed, curated and presented? What is the purpose and audience of the portfolio? Who is the audience? How is the portfolio presented to? How do the portfolio and digital badges relate? Is the portfolio being submitted for assessment? Do you have learning analytics packages for badge issue upon claim? How will the digital open badges be claimed? Who will endorse and verify the claims? Do you need a team? How will they be presented—in the portfolio or on top/in front of the portfolio as evidence?

4.1.1 Understand: Exploring the Terrain

One of the first observations in design thinking is to develop an understanding of the problem. Developing an understanding through empathy can stimulate solutions to change that are personal and responsive to the issue at hand.

As a team of educators ask yourselves: What is to understand in the context? This is as much about backward design as defining the question. Where will the evidence be curated? What are your learners evidencing? Consider your learning outcomes, what skills and knowledge will they develop? What are the threshold learning concepts? wicked problems? transformative moments? how are they applying their newly acquired knowledge or reinforcing what they know in the discipline?

4.1.2 Observe: Investigating the Terrain

Once the problem has been defined by the team, the next step in the design process is to observe and explore a range of solutions collaboratively. When designing digital open badges, we have found that when all stakeholders: earners, issuers, readers and endorsers of badges supports the incubation of the idea.

As a team of educators ask yourselves: What is the purpose, audience and context of these badges? How do you design the alignment from learning, teaching, assessment, evidence and badge? Where does the portfolio fit?

4.1.3 Point of View: Looking, Learning and Designing Together

Exploring the potential and opportunities of digital open badges requires the right people in the right content. The aim of this step is to delve into the problem and discover what has been done before. What worked and what research tells us about the problem we are trying to solve.

As a team of educators ask yourselves: What badge claims are you designing?

- Badges for validation of self, experience, knowledge or achievement,
- Badges as credentials, formal awards or certification,
- Badges for life?

4.1.4 Ideate: Design Thinking in Action

The phase of the design process is collaborative and team based. Together the team asks the question: What is it that the learner needs to know and demonstrate from this experience? The question lies within the designer's point of reference and the team make up. If the design team is not learning, then the learners are not learning. This sets a different precedence of the normal instructor led design. The stakeholders have to be willing to learn through the experience of creating as well.

As a team of educators ask yourselves: Who sets the criteria and standards of the badge?

How will these badges add value to learning and how can this enact action upon the learner to contribute to life?

How do we as stakeholders create different learning paths for the learner to choose? The design phase includes testing the assessment, the evidence to be curated and how the claim is created.

4.1.5 Prototype: Iterative Implementation and Re-design

Digital badges add a significant layer to a learner's growth when integrated into the design and implementation of the learning experience. They indicate achievement, skills, and knowledge at a granular level and convey aspects of a learner's identity for both themselves as well as an audience who reads them. Designing a badge or badge ecosystem that you could use in your context to warrant learning; recognize achievement, capability, knowledge or experience; or, motivate learners includes asking yourself a number of leading questions as you test out the learning design:

1. Why do you want to issue these badges?
2. What value do you think these badges will have for the recipient/earner and the issuer?
3. What would you use these badges to warrant in your context?
4. How will the use of these badges recognize, motivate and/or verify skills, experiences and knowledge of your students?
5. Does the badge encourage any behaviors?
6. What do you need to do to earn this badge?
7. What evidence will the badge require? How is the curated portfolio of evidence presented or assessed?
8. How do the badges and portfolios in the design reflect and respond to each other?
9. What will the issuing of these badges do/solve/represent in your institution?
10. What levels/standards will your badges need?

4.1.6 Test: Designing Evidence

Testing is ambiguous and over used term/tactic in our society. However, in design it is the final stage where we test our hypothesis. How do we demonstrate and share a learning experience? Portfolio and badges are an element or conduit of expression for the learning as well as the stakeholders involved.

As a team of educators ask yourselves:

- How do your badges reflect and respond to each other?
- What would these badges do/solve/add to/represent in your context?
- What levels and standards will your badges need?

- How can the learner articulate the learning experience through the badge?
- Does the badge hold and evidence the portfolio?

We have found that the Digital Me Badge Canvas (2013) (found at http://www.digitalme.co.uk/badgecanvas/) is a great resource and template for recording the ideation phase of the stakeholder design phases.

5 Conclusion

"Digital badges are particularly relevant to our changing world because they open up our current system of rating and ranking to more nuanced levels of understanding, and allow a more evidence-based or personalized analysis of learning than traditional credentials provide" (Grant, 2014, p. 11). Digital badges have provided higher education providers with an opportunity to recognize more detailed aspects of learning. For example, whereas achievement of learning may be somewhat invisible in the evidence of grades, badges have been found to enable the endorsement of competencies, capabilities and skills. Often in higher education, those that go unrecognized on the academic record. We have set out to present how imperative the design process is to curating and presenting explicit learning journeys. Not only for the learners but for a range of stakeholders. This curated journey includes the design of new learning ecosystems. The portfolio and badge pathways in the ecosystem have to be looked at from a holistic natural point of view of the learner. As industry professionals and educators we have to look at *our role* as lifelong learners. We have to shape and establish an ecosystem that is designer centric to create critical thought, self-reflection, skill building, and innovative thought to help build our society. Badges are an element of design that can help achieve this as an immersive technology. As designers and educators we feel an ethical responsibility to share through openness, not just shaping workers but creators.

In this chapter we have demonstrated our own evidence as learners in a community that harnessing creativity and meta-cognitive action of reflection we can design badge claims that warrant portfolio evidence. These claims need to be endorsed and verified, through the curation of evidence in digital portfolios by key stakeholders. The end product of the learning journey is then backward designed through the use of the design thinking process. Utilizing immersive design and design thinking approaches to develop authentic contextual portfolio strategies for learners, allows for creativity to emerge and allow for human centered, experiential, creative problem solving.

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Part IV
Case Studies: Practices and Experience

Chapter 21
Digital Badges for Professional Development: Teachers' Perceptions of the Value of a New Credentialing Currency

James Diamond and Pilar Carmina Gonzalez

Abstract This chapter discusses findings from a 1-year exploratory study of an online teacher professional development (PD) program, and an accompanying digital badge system. Twenty-nine middle and high school history and social studies teachers from 13 states participated in the design-based research (DBR) study. Data include responses to online surveys, back-end activity logs, and interviews. Because the badge system was based on a mastery-based approach to teacher professional development and required a significant time commitment, relatively few participants obtained badges. Most teachers acknowledged the value of the badges as credentials for external audiences, but none received any formal recognition by their schools or districts. All participants saw value in the competency-based approach to professional development, but without some form of external validation, they felt that most teachers would be disinclined to pursue these types of badges. An important finding to emerge from participants' comments is the idea of using a badge system to structure professional development activities such that they are linked to a discipline-specific system that builds teacher mastery of content and instructional practices. We discuss the findings in the context of using DBR methods to help construct useful credentialing systems. The findings have implications for designing badge systems that offer solutions to complex educational problems.

Keywords Badge • Digital badge systems • Teacher professional development • Design-based research • Competency-based learning • History education

J. Diamond, Ph.D. (✉) • P.C. Gonzalez
Education Development Center|Center for Children & Technology,
96 Morton St., 7th Floor, New York, NY 10014, USA
e-mail: jdiamond@edc.org; pgonzalez@edc.org

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1 Introduction

In this chapter we discuss findings from a 1-year exploratory study of an online teacher professional development (PD) program—and accompanying digital badge system—called *Who Built America Badges*: *Common Core Professional Development from the American Social History Project* (*WBA* hereafter). Our main research question was, "In what ways do the features of a digital badge system support or impede history and social studies teachers' progress toward mastery of a new set of practices in an online, competency-based professional development program?" Created by the American Social History Project (ASHP), a K–12 history and social studies teacher professional development (PD) organization and social history research center at the Graduate Center of the City University of New York (CUNY), the PD program's main objective was to help teachers build and practice new instructional routines that developed their students' disciplinary literacy skills in the domain of history, in addition to their historical reasoning skills.

Our goal is to share findings from an early, systematic investigation of a fully launched digital badge system, and to discuss the implications for future designs such that badges might become meaningful and scalable professional development credentials in the context of K–12 education.

1.1 Our Approach to Studying Digital Badge Systems

The use of digital badges as educational credentials is a very new practice (Olneck, 2015), especially in the area of professional development, although the portfolio-like qualities in some badge systems do have a rich history in the context of teacher education (Guskey, 2000). To begin a research program by asking whether badges *as such* might become viable forms of credentialing over time, however, is not helpful for building a field of study. Indeed, some of the impetus behind the current enthusiasm for alternative credentials proceeds from dissatisfaction, particularly among employers, with treating higher education degrees as all-purpose indicators of skills (Kolowich, 2014; Olneck, 2015). Asking only relatively superficial questions about the impacts of badges runs the risk of supplying answers that perpetuate current limitations in credentialing systems.

We believe a more generative approach to research on badges is to start by asking, "For what problems, in which settings, and for whom can a digital badge system offer solutions?" In practice, this entails beginning investigations by identifying and describing the complex social and technical dynamics of the environments in which a technological innovation will unfold (Bennett, McMillan Culp, Honey, Tally, & Spielvogel, 2001), and only then proceeding to focus on a tool's affordances and limitations in a given setting. Further, it means rejecting technological determinism (Feenberg, 1999), uncritical assumptions about a tool's "value proposition," and an overly narrow focus on whether a tool alone "produces" the intended learning outcomes. Such assumptions have frequently prevented educational technology researchers from generating findings that contribute to meaningful changes in educational practice (Amiel & Reeves, 2008).

Tools exist as components of more complex technological systems (Amiel & Reeves, 2008). Hickman (2001) explained this succinctly in his summary of John Dewey's philosophy of technology by writing, "Technology involves more than just tangible tools, machines, and factories … [it is] the *invention*, *development*, *and cognitive deployment of tools and other artifacts*, *brought to bear on raw materials and intermediate stock parts*, *with a view to the resolution of perceived problems*" (p. 26, emphasis in original; see also Amiel & Reeves, 2008). A tool, then, is subservient to a problem, which is defined by people with objectives and some stake in a problem space. As Hickman (2001) argued, "When technology has done its work … new techniques are secured and equilibrium is restored" (p. 12). Within this framework, a fundamental question is, "How can tools be designed best to meet the needs of specific users, knowing their goals, their individual development with respect to the environment in which they operate, and their perceptions of the challenges they face?"

Given our approach, we find that design-based research—DBR—methods (Design-Based Research Collective, 2003; Wang & Hannafin, 2005) are especially suitable for studying the role of badges as solutions to specific educational problems. DBR includes pragmatic research methods (Wang & Hannafin, 2005) that help to study "complex problems in real contexts … integrating known and hypothetical design principles with technological advances to render plausible solutions to these complex problems" (Reeves, 2006, p. 58). DBR methods foreground the dynamics of the socio-technical contexts for technological interventions and seek to understand the complex interactions between people, tools, and institutional norms (Amiel & Reeves, 2008; Wang & Hannafin, 2005). Hence, we assert that using DBR methods to study the role of badges as solutions to certain problems-in-context will lead to a stronger knowledge base from which to inform the design of future badge systems.

1.2 Badges and Teacher Professional Development

To describe the scope of the problem space for the current study, we return to our earlier reference to the dissatisfaction about the value of credentials. Frustration about a credential's lack of trustworthiness as an indicator of skills and dispositions suggests either a deeper uneasiness with the quality of the educational programming on which the credential is based, or a misalignment between what the credential purportedly represents and what it might actually mean in a given context. Both of these conditions exist in the domain of K–12 teacher professional development.

Educators and researchers have long documented the poor quality of in-service (i.e., intended for those already in practice) professional development activities, which frequently place teachers in the role of passive recipients

(Little, 1994). Ball and Cohen (1999) observed that most teacher PD is "intellectually superficial, disconnected from deep issues of curriculum and learning, fragmented, and noncumulative … Since professional development is rarely seen as a continuing enterprise for teachers, it is only occasionally truly developmental" (p. 4). Further, in-service PD activities are often unrelated to the complex interactions that occur continually in classrooms among teachers, students, and content (Little, 2006).

What is unique to the badge system in this study—and significant to the broader enterprise of teacher professional development—is that each badge, or credential, signifies an individual instance of teacher PD activity that is linked to a larger, discipline-specific system created to build teacher mastery of content and instructional practices. The *WBA* badge system enables a consistent, incremental approach to in-service professional development. Some badges are obtainable after a single activity, while others are "prerequisites" that constitute a more advanced badge when taken collectively. But each badge represents an element of a comprehensive conceptualization of "mastery," as defined by the teacher educators and social historians who created the system.

Badge systems are a novel and relatively unstudied (see Gamrat, Zimmerman, Dudek, & Peck, 2014 for an exception) method for credentialing in-service teacher professional development activities. Like the teaching portfolios (i.e., selections of artifacts that provide information about teacher practice) to which they are related, however, badges can give teachers a structure with which to document their professional development over time and enable them to present pedagogical artifacts, such as lesson plans or graphic organizers, that demonstrate their mastery of content, or that feature their abilities to design and implement lessons, or assess student work (Shulman, 1986; Wolf & Dietz, 1998).

WBA badges are designed to function as indicators of achievement for an external audience of professional peers. That is, in principle, the activities and accomplishments symbolized by the badges should be recognizable as components of a comprehensive professional learning system for history and social studies educators. The learning objectives for content knowledge and pedagogy are likely to be familiar to a broad range of teachers, as well as to schools and districts.

Consequently, to evaluate its usefulness as a tool to support professional development beyond the personal value to a teacher, a badge should be appraised primarily in relation to the other badges to which it is connected in the system, as well as to the badge system as a whole, rather than on its own. Additionally, the usefulness of the entire badge system, as a set of activities to support in-service professional learning, should be evaluated in relation to at least two other sets of factors: First, the priorities and policies of the schools and districts in which badge holders and seekers work; and second, the broad set of competencies—identified formally or informally and locally or nationally—associated with being a history or social studies teacher.

1.3 Context: (New) Badges as (New) Credentials for a (New) Form of Online Professional Development in a Climate of (New) Standards Reform

The badges were not the only innovation to affect teachers' experiences during this study. Additionally, at least three other features of the *WBA* program were novel for nearly all participants: (1) The use of standards-based learning objectives; (2) A focus on Common Core literacy skills *specifically in the service of improving practices among history and social studies educators*; and (3) The asynchronous format of the online PD. We discuss each briefly below.

Standards-based PD. In contrast to "standalone" PD, standards-based PD models can incorporate competency-based targets because they are tied to widely recognized competencies. For example, the certification processes such as those undertaken by teachers who apply for National Board Certification orient professional development objectives toward standards that benchmark demonstrable, high-quality teaching practices (Ingvarson, 1998; Ingvarson & Hattie, 2008; Lustick & Sykes, 2006).

Currently, however, there are no national standards in the fields of history and social studies education, as there are in mathematics education. Their absence is due, in part, to past controversies related to establishing U.S. history content objectives at the national level (Nash, Crabtree, & Dunn, 2000). Interestingly, however, the Common Core Standards (NGA/CCSSO, 2010) and the National Council for the Social Studies' College, Career, and Civic Life (C3) Framework for Social Studies State Standards skirt this controversy by making little or no reference to specific content objectives. Rather, they focus on disciplinary concepts and practices such as "arguing from evidence," or "identifying an author's point of view" in order to understand her or his motive for creating a document.

The Common Core State Standards. Since 2010, 44 states and the District of Columbia since 2010 have adopted the Common Core State Standards. The Common Core introduced an emphasis on literacy instruction across all areas of the curriculum, necessitating new competencies beyond many teachers' traditional content orientation. The standards also required "shifts" in teachers' instructional practices to help students achieve the new learning objectives and to prepare them for the resultant state-level assessments. These standards did not exist when many current teachers completed their pre-service training, thereby necessitating in-service PD to help them integrate a focus on the reading and writing skills into their existing routines.

Historically, a gap has existed between the types of expectations for higher-order student learning goals articulated in reform agendas such as the Common Core and the comprehensiveness of teacher professional development systems to help teachers and schools reach them. That gap has also extended to the allocation of resources to build those systems (Little, 1994). Significant challenges at the state policy and local implementation levels frequently prevent the kinds of systemic approaches to high-quality professional development that are necessary to reorient teaching and learning toward ambitious reform goals (Darling-Hammond, Wei, Richardson, Andree, & Orphanos, 2009; Knapp, 2003).

On-line PD. Well-designed online professional development programs can be valuable additions to "teacher learning communities" (Little, 2006) that seek to improve teacher professional learning experiences. The affordances of Web-based teacher PD programs—notably, the ability to offer a range of professional development services that teachers can access according to their own schedules, over time, and at a distance—generate opportunities to provide teachers with otherwise difficult-to-obtain high-quality PD materials repeatedly and as they need them (Dede, Ketelhut, Whitehouse, Breit, & McCloskey, 2009; Fishman et al., 2013).

The specific features of online professional development programs that contribute to improvements in teacher learning and practice are understudied, however, particularly in the areas of history and social studies. Moon, Passmore, Reiser, and Michaels (2013) argued that, "the field needs to go beyond treating modality as a main effect that considers online and face-to-face as two discrete forms of PD, and needs to investigate how these conditions interact with design features of the PD" (p. 173). The current study responds to that challenge.

Summary. The problem space in which the *WBA* badge system exists is complex. ASHP created the online PD and badge system to scale a set of Common Core-focused PD activities to a national audience of history and social studies teachers. Every state has its own policies for granting credit for professional development, however.

It is evident that *WBA* is *first* a professional development program, and *then* a digital badge system. That is, the credential system serves the broader enterprise of teacher learning in a standards-based framework. Accordingly, to study how effectively the badges support the PD goals, we adopted an evidence-based framework that is used to identify effective PD programs. Using the framework, we analyzed our data to determine how well each aspect of the PD system aligned to the features of high-quality PD. Before presenting our findings, we describe the analytic framework.

1.4 Analytic Framework

We used five evidence-based "core features" of effective learning in professional development. Desimone, Porter, Garet, Yoon, and Birman (2002) identified the features in a national study about PD programs that contributed to changes in practice for math and science teachers; each is described in Table 21.1. As summarized by Little (2006), the research about these features suggests, "teaching to high academic standards requires subject knowledge *for teaching*. This pedagogical content knowledge (Shulman, 1986) is most effectively developed through professional development that combines a number of key features. Effective professional development is content-focused, active, collective, coherent, and sustained" (p. 8, emphasis in original).

Teachers can only achieve *WBA* badges by submitting materials, communicating with peers, reflecting on their work, and responding to feedback from the teacher

Table 21.1 Evidence-based "core features" of PD that contribute to improvements in teacher practice (adapted from Desimone, 2011; Desimone et al., 2002; Little, 2006)

PD feature	Description
Content focus	**A sustained focus on a teacher's subject area**, connected to standards, curriculum, instruction, assessment, and knowledge of how students learn in that content area
Active learning	**Teachers should be actively involved** in the PD activities, engaged in activities such as looking at student work, receiving feedback on teaching, giving feedback to peers, or participating in lesson studies
Duration	**PD activities should be sustained over time** and focused on content, curriculum, and student activities
Collective participation	Teachers from the same grade level, subject area, or school should **engage in PD activities together**
Coherence	**PD activities should be consistent** with other professional development, existing knowledge and beliefs, and with school, district, and state reforms and policies
	For the purposes of this study, we distinguish between two types of coherence: "**internal coherence**," which refers to (a) whether the activities for each badge are logically related to other badge activities in the system, and (b) whether the progression logic of the badge system comports with a teacher's understanding of developing expertise in history and social studies education; and "**external coherence**," or the extent to which the activities that the badge system represents are consistent with and recognized by the institutional norms and logics and priorities of schools, districts, and states

Table 21.2 "Core features" of the *WBA* PD program

PD feature	Description
Content focus	Inquiry units that focus on U.S. history content and disciplinary literacy skills; activities that target improving teaching practices for history and social studies teachers; badges reflect a focus on instructional design and pedagogical content knowledge specific to history education and were generally recognizable to participants as important aspects of mastery
Active learning	Teachers teach and modify lessons; annotate student work; reflect on implementation; respond to feedback; and plan for future lesson implementations. Badges reflect achievements related to these activities
Duration	Inquiry units cover various periods of American history (though limited to four for most of the study). Badges reflect iterative nature of lesson design and changes in instructional routines
Collective participation[a]	Online teacher forum allows teachers to ask and respond to questions
Coherence	PD activities address the need to improve teachers' practices related to literacy instruction, via the Common Core ("external coherence"); as described in the Content focus feature above, teachers recognize *WBA* activities as related to the work of history and social studies education

[a]Because the teacher forum was still under development during the study, most teachers did not use it because of usability issues. Therefore, we exclude it from our analyses below

educators at ASHP. Hence, the badges provide an organizing structure for progression through the competency-based system. Table 21.2 summarizes the specific features of the PD activities, materials, and badges that align to each of the core features.

This framework enabled us to analyze features of the *WBA* system—as represented by specific materials, activities, and technology affordances of the program—and their impact on teachers' PD experiences during this study. Further, we used it to learn more about the connections, where they existed, among the five features and the digital badges for the nine teachers whom we interviewed. The badge system is both a feature and the infrastructure that supports the iterative nature of the competency-based professional development program.

2 Methods and Procedures

2.1 Background

In 2012, ASHP received an award from HASTAC's (Humanities, Arts, Science, and Technology Alliance and Collaboratory) *Badges for Lifelong Learning Competition*. ASHP proposed to create a free online history and social studies teacher professional learning program called *Who Built America Badges*: *Common Core Professional Development from the American Social History Project* (*WBA*). Subsequently, Education Development Center, Inc.'s Center for Children and Technology received an award to lead a study on the efficacy of using the *WBA* badge system to support history and social studies teachers' PD goals.

2.2 About the Badge System

Figure 21.1 illustrates the *WBA* badge system. There are 12 badges: 11 that are organized into three categories of mastery—Community, Specialist, and Builder—and one Master History Teacher badge. Together, the categories represent ASHP's conception of excellent history teaching. Educators receive Community badges by contributing to the health of the online professional learning community, through actions such as sharing useful teaching materials, giving peers constructive feedback, or commenting and responding to others in the teacher forum. To earn three of the four Specialist badges, teachers must create and share a mini-lesson that integrates technology meaningfully or helps students focus on a specific Common Core reading or writing task (earning the fourth Specialist badge, History Geek, requires teachers to score 100 % correct on four of the quizzes at the beginning of each inquiry unit). Teachers receive Community badges based on positive feedback (e.g., pressing a "thumbs up!" button) from other teachers and teacher educators, while only teacher educators at ASHP can grant Specialist badges.

Builder badges are incremental and hierarchical. That is, to receive an Apprentice Builder badge a teacher must complete four steps, as illustrated in Fig. 21.2: (1) "Know

Fig. 21.1 The *WBA* professional development badge system

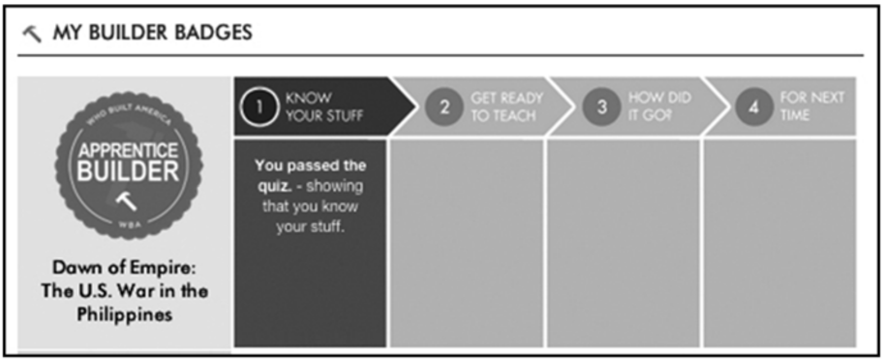

Fig. 21.2 *WBA* Builder badge progression

your stuff”: Download an inquiry unit, study the materials, and take a quiz; (2) “Get ready to teach”—Share modifications to the unit materials, as well as instructional goals, with the teacher educators and teach at least two lessons from the unit (including a lesson with a student writing product); (3) “How did it go?”—Reflect on lesson implementation and share two pieces of annotated student work with the teacher educators; and (4) "For next time"—Share modified unit materials and "lessons learned" based on implementation reflections with the teacher educators. At each stage, teachers submit materials via a series of online forms. Only the teacher educators (and, in principle, master teachers, though there were none during the study) can approve teachers' progress toward a Builder badge, as well as award the three Builder badges.

Finally, to receive a Master History Teacher badge, a teacher needs to earn at least two Specialist badges, two Community badges, and the Apprentice, Journeyman, and Master Builder badges (for each of those, they must have completed the four steps above). Teachers must also submit a new inquiry unit, of their own design, and have it approved by teacher educators or master teachers. ASHP originally expected that it would take teachers an average of 40 h, above the time spent teaching materials, to achieve a Master History Teacher badge.

2.3 Site Users and Study Participants

All site users. Between November 2013 and October 2014, 356 educators from 41 states and the District of Columbia registered for the *WBA* site. Eighty-one percent (n = 290) of registrants identified as classroom teachers and the remaining 19 % (n = 66) included small numbers of curriculum and technology specialists and literacy coaches, as well as one principal, one assistant principal, and two student teachers. Nearly all registrants (n = 337) were history, social studies, civics, economics, or humanities teachers. Forty-four percent of registered users (n = 158) were from New York State (primarily the New York City public schools) and the remaining 56 % taught throughout the other 39 states and DC. The majority of registered teachers were veterans: 57 % (n = 203) taught in their primary subject area for at least 8 years and 36 % (n = 128) taught for at least 13 years. Though it is an imprecise indicator of activity because it is impossible to know whether and how long visitors were active, the average number of visits for all users was four visits.

Study participants. Twenty-nine teachers from 13 states participated in the study: 11 from New York State; five from Arizona; two each from Kentucky and Iowa; and one each from California, Illinois, Indiana, Minnesota, Missouri, New Hampshire, Utah, Virginia, and Washington State. All study participants identified themselves as history, social studies, civics, or economics classroom teachers, though one was also a grade leader and another a department chair. Similar to the larger number of site registrants, the majority of study participants were veteran teachers: 72 % (n = 21) taught for more than 8 years and 45 % (n = 13) taught for more than 13 years; only 14 % (n = 4) taught less than 3 years. Participants taught at the elementary, middle, and high school levels. The average number of visits for all study participants was eight. The average number of visits for badge earners was 25. Finally, the majority of the study participants had at least a Masters degree (n = 26, 90 %) and half of those (n = 13) had concentrated in history education.

2.4 Data Collection Methods

During the 2013–2014 school year, participating teachers agreed to download at least one of four "inquiry units" from the *WBA* web site; modify existing lesson plans in the unit; teach them; share reflections with teacher educators; and respond to comments and critiques from their peers and teacher educators. As they completed tasks, teachers received a badge from one of three categories, depending on the nature of the activity. Teachers who completed the research tasks (completing a pre-participation survey; completing a survey after receiving one Community badge, one Specialist badge, and one Builder badge; and participating in a follow-up telephone interview) received up to $250.00 in cash cards. We invited all study participants to participate in follow-up interviews; we interviewed nine: five teachers who did not earn any badges and four who earned either a Builder or Specialist badge.

Data included: (1) System-generated logs for all teachers who earned at least one badge beyond the *WBA* Member; (2) Pre-participation surveys; (3) Surveys following badge awarding (6 surveys max.); (4) Communication logs from the teacher forum; (5) Communications with ASHP teacher educators via the submission forms; and (6) Follow-up phone interviews with nine teachers.

2.5 Data Analysis Methods

We used teachers' pre-participation surveys to describe their previous PD experiences and with badges or digital badges. The system-generated logs enabled us to quantify the types of badges teachers earned. To analyze teachers' comments from the badge surveys and follow-up interviews, we conducted a thematic analysis using five "prior-research-driven" codes (Boyatzis, 1998) based on research by Desimone et al. (2002). We also created a small set of "inductive" codes (Boyatzis, 1998) as we reviewed the data and learned more about teachers' perceptions about the badges.

3 Findings

3.1 Summary of Badging Activities

Table 21.3 displays the number of badges awarded by ASHP for each type. Seven percent (n = 2) and one-and-a-half percent (n = 5) of study participants and non-study participants, respectively, earned an Apprentice Builder badge. The total number of badges acquired by an individual means comparatively little, however, as there are qualitative differences between the efforts associated with achieving different badge types. For example, the two study participants who achieved Apprentice Builder

Table 21.3 Number of recipients by badge title

Badge title	Study participants; average number of hours to achieve the badge (n = 29)	Non-study participants (n = 327)
Apprentice Builder[a]	2 (7 %): 16 h	5 (1.5 %): N/A
Journeyman Builder[a]	0	0
Master Builder[a]	0	0
Master History Teacher	0	0
History Geek	5 (17 %): N/A	5 (1.5 %): N/A
I Love Sharing	4 (14 %): 1 h	3 (.9 %)
I Love Community	3 (10 %): 1 h	2 (.6 %)
Common Core Reading Specialist	1 (3.5 %): 1 h	1 (.3 %)
Common Core Writing Specialist	1 (3.5 %): 1 h	0
Constructive Critic	0	2 (.6 %)
Tech Guru	0	1 (.3 %)

[a]Builder badges each consist of four "sub-badges," or "stars"

badges committed significant amounts of time beyond classroom teaching time to complete the work for the badge: 8 h and 25 h, respectively. In contrast, another teacher took a total of 2 h to earn two Specialist badges: a Reading Specialist and a Writing Specialist badge. Like quantity, time spent on a specific badge is also an imperfect indicator of its value as a professional development activity, particularly in a competency-based system that eschews a "time on task" orientation for mastery. Nonetheless, some badges require more effort than others.

In the following sections, we use the analytical framework (see Table 21.1 above) to explain how the requirements for achieving badges affected teachers' experiences with the PD, using positive and negative comments made about each feature. In the final section on "coherence," we return to participants' comments about specific badges in order to analyze the "internal and external" coherences between the features of badging activities and teachers' goals and districts' policies.

3.2 *The Role of Working Toward and Achieving* WBA *Badges in Teachers' PD Experiences*

In this section, we analyze positive and negative comments from teachers about three of the core features: content focus, duration, and active learning. In general, the teachers with whom we spoke appreciated the content focus, but found the level of effort required to achieve badges to be too much, even if the effort could be extended over time. We address teachers' comments that related to "badges as professional credentials" and peer perceptions in a separate section on "coherence" below.

Content focus positive. The teaching materials were the most compelling feature of the *WBA* site for all of the teachers whom we interviewed. Nearly all of them commented on the quality of the primary and secondary sources, as well as the lesson plans in the inquiry units. One teacher said, "Like all teachers, I'm always looking for stuff I can use in the classroom, either tomorrow or next week. And this was really good stuff that I could use right away." Seven of the nine teachers said that they were very likely to use lessons from the *WBA* site again next year.

Five teachers mentioned that the materials would help them address the need to integrate a focus on literacy practices into their teaching. One teacher in Washington State commented, "We're trying to have our students here use primary source materials more. I liked how on the WBA site they had the units built up on different topics, and that it included the Common Core standards. It was killing two birds with one stone: content and Common Core." Another teacher, in Kentucky, noted that, "I am slowly adopting my lessons to resemble the Common Core. It's been adopted in every other subject area, so I'm adopting my lessons to meet that. With your materials, I'll be prepared, so there will be less of a transition for me."

Content focus negative/Duration negative. Two aspects of the *WBA* program's in-depth focus on historical content were a hindrance for all of the teachers with whom we spoke: the relative lack of content to cover the entire U.S. history survey and the scope of the existing inquiry units. For much of the year there were only four units from which teachers could choose, which left several participants in the position of having passed points when they could use the content with their students. Being unable to teach those units also left them in the position of being unable to pursue Builder badges.

The scope of the inquiry units was also off-putting for several teachers. One teacher in Utah commented that, "There's too much. These units are gigantic. I have 2 days to teach the Industrial Revolution, but this thing could take 2 weeks. The mill girl thing, I didn't even know how to start to pull that apart to use it in my classroom. I would like to see smaller units, smaller chunks. Eventually, I hope that you will continue to have more units, but shorter, that will fit into my work."

The challenge of the time it took to teach a *WBA* unit affected several teachers. One of the Apprentice Badge earners said, "I didn't really have any grand schemes for this. You just had to start early and then keep going with the reflections afterwards. In the War on the Philippines [unit], I thought 'I'd like to do this,' but I also thought I wouldn't have time to do everything. It just didn't fit into the time I had in the scope and sequence." Another teacher also felt that the units would take too much time, but that he would be in a better position to use them in the following year.

Active learning positive. Six teachers told us they felt that the activities during their participation were valuable to their professional growth. Further, several felt that the level of activity expected of teachers in *WBA* was unique, and positive, among their experiences. Three teachers—one of whom earned an Apprentice Builder badge—commented specifically on the cycles of reflection and feedback that were built into the submission processes to earn badges. A badge earner commented that,

> The reflection piece is awesome. You know, we learn from reflecting. It's a really positive thing. It [the PD program] actually makes you use the strategies and do the activity that you learned about. In a lot of in-services you tell yourself, 'that's a great idea,' but you don't do

it. But in this one, you actually had to do the lesson in order to advance, in order to move on. I really like that about this.

Active learning negative. The high level of teacher activity was also a drawback for some, however. Several teachers spoke at length about how much time this PD seemed to demand, even among those who felt positively about being required to submit materials and respond to feedback. As one teacher put it, "For this thing to be successful, the main thing that needs to be taken into consideration is that teachers are so extraordinarily busy. You have to take their time into consideration for it to be meaningful. This work is good and important for development, but there's so much other stuff to do." Another said, "This is really time consuming. You have to pre-plan, pass the badge, make sure you have that many days in the schedule, and then remember to go back to it to submit whatever else you have to submit. You only have 24 h in the day. It's a lot of work, this PD. And I've already got a lot of work."

3.3 Coherence with Other Professional Development, Existing Knowledge and Beliefs, and with School, District, and State Reforms and Policies

We distinguish between "internal coherence" and "external coherence" for analytic purposes, but both relate to the degree to which PD activities in the badge system align to perceptions, norms, priorities, and values associated with history and social studies teaching, either for an individual teacher or an external agency such as a school or district.

Internal coherence positive. Internal coherence is the degree to which PD activities in the badge system seemed logically connected to each other, as well as the extent to which the progression logic (i.e., how teachers advance within the PD system by achieving badges) reflected teachers' personal understanding of what it meant to develop expertise as a history teacher. External factors are likely to inform the latter and so the differences between "internal" and "external" coherence are guidelines, rather than rules.

Six interviewees indicated that the badge system "made sense as professional development credentials," even if they were not personally interested in using the badges as such. For example, one teacher said, "Yes, they made sense to me. But, the difference between their importance to me and what I'm doing, and what I'm required to do in my school, did not really jive together." Another remarked, "The idea of earning a digital badge, it seemed kind of odd". But I talked with co-workers who said "Oh yeah, you can earn badges for different things you do on the Web, like in games. So, I get how you can use them to show that you accomplished something." Comments by two other teachers suggested that, while several activities related to specific badges made sense and appealed to them, they did not see how the badges connected meaningfully as a professional development sequence.

An important theme related to internal coherence was "sequence and progression." Five of the seven teachers for whom badges seemed viable as professional credentials made comments that suggested an appreciation for how the badge system "chunked" PD activities and portrayed professional development as a progression. For example, one teacher said, "I like how you had to get a certain percentage to get the History Geek badge. I had to take a few quizzes more than once … I thought that was great … To move on to the next step, it doesn't allow you. You have to unlock a certain level, it's sequenced." Another remarked that, "I could see a gradual progression through them. It seemed very doable. I got excited. I thought that I wanted to take the time to do it."

Internal coherence negative. Comments from three teachers suggested that the *WBA* badge program lacked internal coherence for them. One veteran teacher commented that, "I'm an older educator, I've been around the block … Not that I'm afraid of incorporating new things, technology, or new ideas. I have no problem with adding, changing, or keeping up … but there's not enough time in my life. I'm not one who's into accolades." Remarks from the other two teachers indicated that the level of work required for earning a Builder badge was not in line with their own priorities for PD.

External coherence. External coherence refers to the degree to which the PD activities align to school and district priorities for teacher training and growth. Two issues related most to external coherence: (1) whether schools and districts granted credit for badges (they did not); and (2) whether peers or school or district administrators valued the finer-grained distinctions among professional development activities that badges might permit (they did not). Both of these issues had implications for whether teachers thought they—and others—would be willing to perform the level of work required a competency-based system such as this one.

One teacher commented, "I think another thing that would incline me to do more is that if the badges turned into something useful. If you could turn them into PD hours, that would make a difference. They're fun for the pat on the back, but it would be better to have in-service pay or professional development credit, that would increase my incentive to do this." Another said, "I like the badge system, it could be fun; but I remember going on there and it wasn't that much fun. It was a lot of reading and I remember it being a lot of difficult work. It became an extension of my job, rather than something I could do for my own professional development. Doing that much work without getting credit isn't realistic." Finally, one other teacher commented, "There has to be a value in it. If people don't see a value in it, forget it … This isn't of value to me because no one has talked to my district about badges … badges just aren't understood."

A second issue related to external coherence is that many teachers do not receive personal recognition for different forms of professional development. Because the norm for most states is seat time, most teachers in this study saw little value in presenting credentials that might distinguish them from other educators, though some are in schools that recognize and value different forms of activity. As a teacher in Minnesota remarked,

> It's more about attitudes toward teaching and learning. Some schools have great professional learning communities. Some schools have great teams of teachers that reflect on their approaches to teaching. They like to try out new ideas. My attitude is that I always have

something to learn. Big school districts probably only look at your hours, they don't know you personally and they're unlikely to look at the specific types of PD you do.

A teacher in New York had a similar comment: "I think it depends on the school. In some schools, if you went through a particularly useful PD, then some principals will require you to turnkey it for other teachers. In my school there's a desire to do that, but it doesn't happen often. You hear about people having PD, but it never gets celebrated in any way. It isn't seen as this wonderful thing." Another teacher expressed the general sentiment about most PD succinctly: "For PD, you just get your certificate. You register online, do a 5-question evaluation and rate it. You say what you got out of it. Then you submit and print certificate. It's just a set thing everyone does, there's no recognition. We have to do what everyone does, which isn't very rewarding."

4 Discussion

In this study we investigated how the features of a digital badge system supported or impeded history and social studies teachers' progress toward mastery of a new set of practices in a competency-based professional development program. We used a framework that included five "core features" of professional development programs identified in previous research as being effective for helping teachers learn and change practices.

The analytical framework of five core PD features was useful for helping us to identify the affordances of a badge system that teachers might value, should professional development programs like *WBA* become acceptable forms of credentialing. Below, we revisit the features briefly and discuss their implications for the ongoing use of a competency-based PD system among history and social studies educators.

4.1 Content Focus, Active Learning, Collective Participation, and Duration

The majority of the teachers whom we interviewed valued the teaching materials above all other aspects of the *WBA* site. Indeed, searches for teaching materials were often "the way in" to finding the project and becoming aware of the professional development program. A smaller number of teachers commented directly on the value of these materials for helping them to learn about integrating the Common Core, however, and we are unable to report on how well teachers did so because none progressed to a point where they could submit new lesson plans.

The ability to reflect, plan, and receive feedback was very attractive for several of the teachers, as most have few opportunities to do it if they are not part of a team of teachers in a school that look at student *and* teacher work together. Further, the chance to have useful, timely feedback on teaching materials from qualified teacher educators was exciting for more than half of the teachers whom we interviewed. Though we had little feedback about teachers' experiences with integrating Common Core-aligned skills during this study, it was a place where two teachers felt the feedback from ASHP was extremely valuable. Both felt that their practices had improved based on that exchange.

All of the teachers commented on how challenging it was to complete all of the requirements for the *WBA* program, especially as there was not enough material on the site for them to use in order to work toward obtaining Builder badges over the school year. While several teachers appreciated the repeated rounds of feedback from ASHP on their materials, the payoff typically did not match the effort, especially when there was no formal recognition for the badges forthcoming.

Our experiences during this study have several implications for future projects that might use a badge system to support competency-based teacher professional development:

1. *Content focus*: Social studies and history teachers value classroom-ready material they can use immediately, which the *WBA* site includes. The units are very large, however, and there currently are not enough of them for teachers to use throughout the school year. If badges are to be tied to teaching the content, then the content should be presented to teachers in smaller lessons that they can teach more quickly and, possibly, more frequently.
2. *Active learning and duration*: PD activities that include submitting new lesson plans and student work, receiving and responding to feedback, and creating new teaching tools are intriguing for many teachers. Several teachers in this study saw the potential for growth as educators through rounds of these activities and liked that the structure of the badge system supported an incremental approach. But they are time consuming and require a level of activity that is not the norm among current PD programs. To make the rigor and level of effort more acceptable, feedback on teacher work should be timely and varied (in that it comes from teacher educators and peers).

4.2 Coherence

For most of the teachers whom we interviewed, the *WBA* badge system aligned to their understanding of what social studies and history teachers needed from in-service PD in order to keep growing, though specific features—as we have discussed—raised questions for them as to whether they could persist in the work. The amount of work in the program is considerable. But the matter is exacerbated by the fact that there are no school systems (or schools) that accept the badges as continuing education units. The lack of external validation has important implications for whether a competency-based badge system can survive and scale when "seat time" is the norm and, in fact, what is generally approved by most state systems.

Earlier we noted the success of standards-based PD programs such as the application process for National Board Certification. One way that a badge system such as *WBA*—and others—might become sustainable is if it is able to secure for teachers benefits such as extra pay or extra privileges. For that to happen, these badge systems will need to demonstrate impact on teaching practice and student learning outcomes. Hence, once ASHP secures commitments from external agencies to support and recognize this type of PD, it should consider other studies to investigate the impact of the badge system on teacher and student-learning outcomes, especially with respect to the new Common Core-aligned assessments that states will begin implementing.

A valuable finding about how a badge system might structure "sequence and progression" in teacher PD emerged from this work. Several teachers expressed that they appreciated how the badges "chunked" the PD and mapped out a progression toward mastery. Findings from this study suggest that badge systems might be one way to make mastery-based PD accessible to a greater number of teachers.

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Chapter 22
When Digital Badges Work: It's Not About the Badges, It's About Learning Ecosystems

Rebecca C. Itow and Daniel T. Hickey

Abstract This chapter reframes the question "do badges work?" to explore *when* badges work. It presents three cases studied by the Design Principles Documentation project to demonstrate dynamic uses of digital badges and discuss the myriad issues associated with using digital badges as an assessment tool.

Keywords Assessment • Recognition • Learning ecosystems • Informal learning • Connected learning

1 Introduction: Emergence of Digital Badge Systems for Education

Open digital badges are web-enabled micro-credentials that can contain specific claims and detailed evidence supporting those claims, which can then circulate in digital networks (Casilli & Knight, 2012). When digital badges for education took hold in 2012, many speculated that badges could revolutionize educational assessment. Groups from all different walks of life began to develop badging systems; some took part in the MacArthur Foundation's *Badges for Lifelong Learning* competition, while others built systems independently of more formal movements. Across the world, digital badge systems aimed to create opportunities for youth to find purpose and joy in writing; for teachers to augment their knowledge and hone their skills; and for students to unearth their abilities to design, innovate, and become leaders amongst their peers.

With extensive coverage in educational and popular media, it appeared that many believed digital badges had the potential to fundamentally, systemically change education. In addition to the DML *Badges for Lifelong Learning* competition (which awarded funds to 30 projects over one year to develop a wide range of digital

R.C. Itow (✉) • D.T. Hickey
Indiana University, Bloomington, IN, USA
e-mail: rcitow@gmail.com; dthickey@indiana.edu

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badging systems), the Mozilla Foundation established the Open Badges Infrastructure (OBI) metadata standards, purportedly imbuing badges with the kind of dynamic evidence of learning most resumes and gradebooks often lack. These OBI compliant badges contain "clickable" links to student work, providing evidence of achievement and—potentially—a more complete view of the learner. As badges gained traction, the Badge Alliance was formed, at least a dozen companies were started, and conferences dedicated entire panels and forums to exploring the potential of digital badges. Several extended projects were funded to study this new way of recognizing learning, including one led by the second author. The various innovations among digital badge systems all aimed to improve education through empowering learners and rewarding them for learning, scholastic and informal alike.

For these innovations to be taken up widely, badge systems needed buy-in from schools, employers, and other institutions for whom the badges were meant to show recognition of a particular achievement. However, these institutions were skeptical; they wanted to know that badges would "work" before they risked their resources and reputations using badges as a viable form of recognition. The answer to the question of whether or not badges "work," it turns out, is much more complicated than yes or no, and actually requires that we reconsider the original question. Instead of asking ourselves whether badges "work," we must ask in what contexts digital badge *systems* can facilitate the kind of learner investment and interaction that leads to the attainment of valued skills without undermining the learning. In essence, the question shifts from *do badges work*? To *when do badges work*? The seemingly simple change in vocabulary presents a very different question—one that will be explored and illustrated in this chapter.

1.1 The Badges Revolution

As digital badges spread in educational settings across ages and domains, many system developers realized that their initial plans for innovating our traditional notions of education were much more problematic than they had thought. Aside from the assumed challenges and professional expectations that come with building networked educational spaces, most innovators likely discovered what many educators take for granted: learners came to these systems with their own expectations and assumptions. While some learners wanted specific instruction and resources for rote practice of discreet skills, other learners often wanted something more. In the case of badges, one of the things that became apparent to the community around 2013 was that many learners wanted to learn something new, something different, something in which they were deeply personally invested—something that *didn't feel like school*.

As will be elaborated, the nascent badge community gradually began to realize that it is not the badges themselves that matter, but the larger learning ecosystems that impact learning and engagement. As projects got underway, developers began realizing that the design choices they made around their assessment practices affected the way they recognize learning, and those choices directly influenced community formation, quality of interaction, and—ultimately—learner investment in the actual badges. These realities presented challenges that many badging projects were not ready to meet. However, three systems addressed these challenges head on, and by shifting their focus from discreet skills and defined learning pathways to collaborative skills and community building, they were able to facilitate the building of complex learner communities in which participants engaged with one another to learn new skills and develop an interest in topics they may otherwise have found unappealing or unattainable.

1.2 Studying Badges for Lifelong Learning

In conjunction with the launch of the 2012 badges competition, the Design Principles Documentation (DPD) project—led by the second author—was launched at Indiana University. This two-year project was tasked with objectively studying the development of 30 digital badging systems funded in the Badges for Lifelong Learning initiative. In doing so, the DPD project documented common practices across the badging systems and their ultimate effect on engagement. Of particular interest were the shifts and changes badging projects made as they developed and piloted their systems. The DPD project documented these shifts, aiming to capture the knowledge gained in rapid cycles of innovation before that knowledge dissipated. Interestingly, the DPD project observed that badging systems which changed their focus from formal, discreet skills toward building badge pathways for informal, collaborative skills (such as leadership and community building) had created ecosystems where learners (a) were more willing to engage with the badge activities and each other, and (b) valued the work and their ultimate badges. Because the purpose of the DPD project's efforts was primarily ethnographic rather than evaluative, this observation was noted but not directly studied.

The DPD project's study was organized around each of the 30 projects' practices for recognizing, assessing, and motivating learning, with one doctoral student focusing on each strand. The first author led the assessment strand, paying special attention to the impact of each project's assessment practices on learners' engagement and investment in the systems' badging activities. Throughout the development of the systems, the authors interviewed project managers and tracked the shifts in designs over two years. These interviews and observations indicated that badge system designers who carefully balanced the formative and summative functions of their assessment choices were more successful in avoiding the "deformative effects" (Torrance, 2012) of assessment that made badging systems "feel like school" and undermined learner engagement. Upon further investigation, it seemed that badge systems that highlighted collaborative skills over discrete skills and fostered peer-centered, networked learning were more likely to take their badging system beyond the beta stages.

2 It's Not About the Badges

When MacArthur funded research and innovations around digital badges, researchers, motivation specialists, and educators around the globe voiced their opinions. Longstanding tension over incentives and motivation emerged, where those who thought badges would be detrimental to education and stifle intrinsic motivation and constructivist learning were met with opinions that badges might productively "disrupt" education and prevailing recognition practices (e.g., Browne, 2014; Carey, 2015).[1] Others, like Jake McWilliams, presented pragmatic concerns that became more and more salient as systems were developed, implemented, and revised. McWilliams (2011), pointing to Henry Jenkins' work on *convergence culture* (Jenkins, 2006), asserted that "symbolic goods cease their movement when they assume too much value or too little worth." McWilliams explained that participation in an extra-curricular activity (in this case, forming a band) fulfilled the purpose of forming community, and that the introduction of badges could very well undermine the natural ebb and flow of the group dynamic. Elaborating on this point, McWilliams pointed out that one's digital presence is available for anyone to see, and that the digital credentials only reveal a small part of the learner.

What McWilliams recognized was that, in looking to badges to be the panacea for a stilted grading system, fervent supporters of digital badges were overlooking the deeper problem—that education has been unable to keep up with the impact rapid technological innovation has had on *the way learners engage with information and each other*. Networked technology has fundamentally changed the way people ask questions and access information, and because technology is evolving exponentially, educational environments must prepare learners for a world that values networked discourse around user-generated content. In essence, it's not about the badges. The badges themselves are images that recognize some kind of learning, but they themselves do not facilitate learning. Even OBI-compliant or "open digital badges" that contain links to evidence of learning are not vehicles for exploration and engagement. The *ecosystems* in which the badges are earned and the *pathways* that lead to those badges are.

It is vitally important for badge system developers to consider ways badges-as-achievement-markers and the assessment practices around digital badges impact learning ecosystems if they are going to be used successfully with budding learners. While digital badging systems may indeed have the potential to transform learning environments into vibrant spaces for exploration, it is necessary to understand how specific choices regarding assessment and recognition of achievements affect learner engagement and the ultimate uptake of new skills.

[1] Many of these tensions were captured in a recorded keynote by a skeptical Alphie Kohn and response by the second author at https://www.youtube.com/watch?v=p_98XcxJqkw and https://www.youtube.com/watch?v=-IaB8N6P4lc

3 It's About Learning Ecosystems

Three badging projects that were part of the DML competition—*Supporter 2 Reporter Medals* (sports journalism for underserved youth), *Who Built America* (history teacher professional development), and *Design for America* (design program for youth)—built learning ecosystems that promoted personally meaningful inquiry within a vibrant community. These cases (also featured in the forthcoming DPD Report) illustrate how a careful balance of assessment choices and a focus on collaborative skill sets had notable impact on learner engagement and investment in new skills. These three cases were intentionally chosen not only because they are representative of successful badging projects, but to highlight the difficulties projects face when building engaging, sustainable learning ecosystems. The issues presented below are nuanced, and posed significant systemic problems that required major changes to overcome them. Unlike many other projects that attempted to implement the practices below, the three example projects had the resources and support to make these shifts mid-development, which enabled them to (a) keep their learners invested and (b) revise or rebuild their system to foster more networked, connected learning.

While each project ultimately aimed to impact discrete skills (journalistic writing, lesson planning, and design skills, respectively), they realized that highlighting collaborative skills and fostering connected learning gave participants agency to build personally meaningful pathways for learning. However, these projects also found that learning ecosystems are fragile; building them around reward systems without careful consideration of the impact on learner interaction can be fatal. The cases below elucidate this point. Recognition practices—such as using digital badges—are inherently tied to assessment practices, which fundamentally shift the kinds of interaction, investment, and engagement that occur in educational spaces. Badges, it seems, tend to "work" better when they are used in informal spaces to facilitate personally meaningful learning of collaborative, "soft" skills.

3.1 Creating Communities Around e-Portfolios

While several of the 30 new badge systems studied in the DPD project proposed using e-portfolios to document learning and growth within their badge systems, only a handful of projects were successful in doing so. *Supporter 2 Reporter Medals* (*S2R*) was a particularly successful project that empowered young sports fans (i.e., "supporters") in the UK through writing projects like videos and blogs. S2R drew very directly on common e-portfolio practices and digital badges to help bridge activity that was organized around (non-school affiliated) sporting clubs with students' secondary school experiences and eventual post-secondary application processes. Learners used their passion for sports to engage in journalistic writing activities. While the program was open to any learner, *S2R Medals* was particularly rewarding for those learners who might not otherwise voluntarily engage in rigorous writing activities outside of school. In addition to actually writing articles, learners put their work into an e-portfolio that was open to their peers, teachers, parents, coaches, and community members for commenting and feedback. The openness of the portfolio served both to provide feedback on specific pieces for revision and to show the learners that their writing efforts were supported and encouraged by their community. Because the project had already conceptualized their learning system with proto-badges in mind (i.e., "medals" on the project website) it was a relatively straightforward process for them to extend their recognition system to use open badges with the additional funding from the Badges for Lifelong Learning initiative.[2]

DPD project interviews and a followup investigation (Ian O'Byrne, Schenke, Willis, & Hickey, 2015) documented how the project succeeded in helping learners use community feedback to revise the entries, and then earn badges when final artifacts were assessed summatively by educators or project members. Learners indicated that the support from this large group of people had a positive impact on their engagement, encouraging them both to improve upon their work and participate in scholastic conversations beyond the walls of their school. *S2R Medals*' ability to minimize the potential deformative effects of the summative assessment by highlighting the value of community feedback ultimately had transformative results. Learners gave and received formative feedback that was both useful and used, enabling them to take risks in their initial entries that they may not have otherwise felt comfortable taking. Ultimately, this gave the learners a sense of agency over their own learning and assessment processes, transforming the learning environment into a participatory space.

3.2 Encouraging Collaborative Feedback

Many of the 30 projects attempted to facilitate formal peer feedback on artifacts by creating mechanisms within the learning community wherein learners could comment either directly on one another's artifacts, or provide critical feedback in a discussion forum. Many of these projects encountered two realities about peer feedback: The first reality encompasses the many challenges associated with (a) managing the process by which peers provide feedback, (b) authors receiving that feedback, and (c) using feedback to revise learners' work. The second reality is that associating grades and/or summative assessments with peer feedback usually presents problems and undermines more formative goals.

The American Social History Project's *Who Built America* (WBA) project is a professional development site where history teachers can learn historical content and new curricular design skills. The highest badge in *Who Built America* is the Master History Teacher badge, which both indicates that the teacher is skilled in designing history lessons and allows the teachers to mentor and assess other

[2] For example, https://www.makewav.es/story/225441/title/reportonyourschoolsportsdays

teachers. WBA intended to have learners comment on each other's lesson designs, and they wanted to award an *I <3 Collaboration* badge for collaborative efforts.

However, the original WBA platform could not support the assessment of collaboration, so the project had to think of a new way to foster this skill. The project ultimately decided to design learning activities that required participation in critical discussion forums. In this way, they encouraged collaboration, but avoided the complex issues around assessing collaboration by awarding an *I <3 Community* badge for participation in the forums. In this way, the project may have ended up fostering more collegial collaboration than they would have in their original design.

The *Who Built America* project realized early on that a formalization of peer assessment may actually undermine the community building they were aiming to foster. Their assessment choices reflected their ability to balance the formative and summative functions of assessment without having deformative effects on learners or the community. Their formative feedback practices also served to engage learners in their own assessment process and award them agency over their own learning.

3.3 Using Rubrics in Badge Systems

Numerous projects asserted that using rubrics would make what was being assessed salient for both the learners and the assessors, and they felt this transparency was important to earning the trust and support of the learners. It seems that one of the reasons so few projects formalized this practice is that designing rubrics that are specific enough to guide learners in completing a task but general enough not to constrain learning is extremely difficult. Popham (1997) explains that rubrics have the potential to actually hinder learning if they are too broad or too narrow; they should be used selectively, making sure they provide expectations of a product rather than encouraging learners to use the specificity in the language to argue for miniscule points (i.e., "Is this what you want??").

Design for America constructed specific rubrics for their learning activities, believing that transparency would allow learners to engage meaningfully with new content and activities. However, the project's focus on the broad topic of "innovation" attracted learners who wanted broader skills. The rubrics were fairly specific, intended to provide learners with a structure in order to innovate, lead, and collaborate. However, when learners were given the rubrics, they reacted negatively, saying the activities felt "too much like school." They felt these rubrics turned the otherwise exciting projects into dull tasks that needed to be completed to pass a test. Learners wanted the badges they earned and the activities around those badges to give them life skills; they wanted the badges to *do something*, not be constrained by learning goals in a rubric. Many learners expressed that they were participating in this project to gain the kinds of skills they felt they did not or could not learn in school, and the rubrics reduced the content to unnecessary and inaccessible tasks.

Design for America brought this feedback to the development team and decided that, while they would not remove the rubrics, the rubrics would play a smaller role in the assessment process. The project decided to focus their efforts on skill building, collaboration, and leadership, valuing formative feedback and opportunities over summative assessments. This major shift changed the way learners interacted in the system. Learners were more engaged and felt that their voices mattered because their feedback had impacted the design of the project. The loosening up of the rubrics also allowed for more creative freedom, giving the learners more opportunities to try out ideas, to take risks, and to ultimately produce innovative designs.

4 Conclusions

Badge system designers face questions from all of their stakeholders: the institutions that would ultimately consume digital badges want to know if, how, and when badges work before investing heavily in them as credentials; learners want to know what the badges "do" once they are earned. The answer is that badges alone do not "do" much, nor do they "work" to inspire much learning. They are markers of achievement that have the potential to point to *evidence of learning*. It is the balanced nature of the learning ecosystem that affords learners an opportunity to forge pathways for exploration and inquiry. It's not about the badges, which can easily lose their value; it is about the ecosystem, the balance of which encourages personal inquiry, fosters community building, and takes advantage of the ways networked technology has shaped learners' engagement with information, each other, and their environment.

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Chapter 23
The Authority Behind the Badge: A Practice Analysis Case Study

Sharon L. Gander

Abstract This classic case study shows how evidence-based microcredentials with authority and rigor come into being, backed by a competent practice analysis and process design. This project created a series of microcredentials for instructional designers and developers based on nine standards that transcend the differences between the different types of learning solutions that Instructional Designers and Developers create. This case study describes the conceptual development of a practice analysis, the results of the criticality analysis, building the microcredential series, development of governance and administrative processes for badge issuance, microcredential marketing, and future directions. The process used was the Hale's 12-step process, which is the gold standard in design and development of evidence-based credentials.

Keywords Practice analysis • Certification • Microcredentials • Badges • Instructional design

1 The Concept's Source and Opportunity

Practice analysis is a technique for defining the standards of a field of practice that crosses many venues, uses different tools and techniques, but purports to accomplish the same goals. It is one of the key techniques used in credentialing along with the job and task analysis or cognitive analysis (Hale, 2012).

This case study describes a practice analysis for the field of instructional design and development. The study finds that the field is large, international, fragmented, and generally unable to demonstrate consistent value for work performed. Job titles and roles vary. There is little correlation between education, experience, and work results. Degree-holders struggle with lack of field experience, while those with field

S.L. Gander, MEd, CPT, ID(SEL/SLG), CACP (✉)
The Institute for Performance Improvement,
9S211 Graceland St., Downers Grove, IL 60516, USA
e-mail: performancepi.gander@gmail.com

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experience battle the lack of an appropriate degree. Career paths are both highly flexible and somewhat obfuscated. Anyone can self-declare as an instructional designer, which challenges both professional instructional designers and their employers. Performance-based credentials would be a welcome first step toward increased field validity based on standards that transcend borders. Credentialing should increase the value of instructional design practitioners regardless of position title.

In 2013, The Institute for Performance Improvement, L3C, USA (TI*f*PI) (http://www.tifpi.org) commissioned a practice analysis to define international standards for instructional designers and developers. A team of expert instructional designers with credentialing expertise tackled the problem using the Hale 12-step process (Hale, 2012). This is the story of the development of that practice analysis including the results of an international criticality analysis survey, and a brief overview of the action steps taken as a result (Gander, 2014).

1.1 The Current State of Instructional Design

Before agreeing to commission the practice analysis and in alignment with the first step of the Hale 12-step process for credential design (Hale, 2012), TI*f*PI needed to understand the current state of instructional design and development roles at least regionally, within the United States. Governmental defined labor role definitions and public job postings were used to define current state issues. A business needs analysis started with research into the role definitions provided by US labor sources and a review of job postings on internet job boards. Findings are discussed in this section.

1.1.1 Government Labor Role Definitions for Instructional Design and Development

Review of public information on role definitions resulted in the comparison in *Table 23.1*: *Comparison of Labor Definitions of ID Roles*, which highlights the similarities and difference between the roles of Training and Development Specialist and Instructional Designer and Technologist as described by US Bureau of Labor and Statistics and O*Net (U. S. Department of Labor Bureau of Labor and Statistics [BLS], 2014; U. S. Department of Labor Employment and Training Administration [O*Net], 2013; U. S. Department of Labor Employment and Training Administration [O*Net], 2014). Both listed a Training and Development Specialist role and O*Net listed an additional role called Instructional Designer and Technologist. Some minor differences in work tasks and skills were identified. For example, the Instructional Designer and Technologist role focused more on materials design and development than classroom instruction. Meanwhile, the Instructional Designer and Technologist also appeared to focus more on the design and development of technology-based solutions. The similarities and differences in role expectations and titles provided insight into the variances in wages, education expectations. There was significant overlap without congruency.

Table 23.1 Comparison of labor definitions of ID roles

	Training and development specialist (US Bureau of Labor and Statistics) (BLS)	Instructional designer and technologist (O*Net)	O*Net training and development specialists (O*Net)
Median USD wages (2012)	$26.89 hourly	$29.14 hourly	$27.57 hourly
	$55,930 annual	$60,610 annual	$57,340 annual
	(2012)	(2013)	(2012)
Education	Bachelor's Degree	65 % Masters	58 % Bachelors
		26 % Bachelors	17 % Masters
		4 % High school or equivalent	11 % Post-baccalaureate certificate
Work Experience in a Related Occupation	Less than 5 years	Not provided	Not provided
On-the-job Training Required	None	Not provided	Not provided
Number of jobs (2012)	228,800	148,000 employees	229,000 employees
Job Outlook (growth) 2012–2022	15 % (faster than average)	8–14 % (average)	15–21 % (faster than average)
Employment Change 2012–2022	35,400	31,100	77,200
What do they do?	Help plan, conduct, and administer programs that train employees and improve their skills and knowledge.	Develop instructional materials and products and assist in the technology-based redesign of courses. Assist faculty in learning about, becoming proficient in, and applying instructional technology.	Design and conduct training and development programs to improve individual and organizational performance. May analyze training needs.

(continued)

The Bureau of Labor and Statistics (BLS) provided information on only the Training and Development Specialist role. BLS did not list a role for instructional designer, but did list roles for learning delivery and training and development manager. O*Net provided two instructional design-type roles with different wages, different education levels, different numbers of positions, and different growth expectations. Together, the O*Net's two roles indicated 337,000 current incumbents in the United States alone. Their estimated growth potential for the 10 years 2012–2022 ranged between 8 and 21 % or around 108, 300 new jobs in the United States. Even though this data was limited to one region of North America (the United

Table 23.1 (continued)

	Training and development specialist (US Bureau of Labor and Statistics) (BLS)	Instructional designer and technologist (O*Net)	O*Net training and development specialists (O*Net)
Reported Job Titles	Not provided	• Chief Technology Officer	• Computer Training Specialist
		• Director Educational Research and Product Strategy	• Corporate Trainer
		• Instructional Designer	• E-Learning Developer
		• Instructional Technologist	• Job Training Specialist
		• IT Senior Analyst (Instructional Technology Senior Analyst)	• Management Development Specialist
		• Lead Performance Support Analyst	• Senior Instructor
		• Learning Development Specialist	• Supervisory Training Specialist
		• Senior Instructional Designer	• Technical Trainer
		• Team Lead	• Trainer
		• Teacher Support and Student Intervention	• Training Specialist

Adapted from "Training and Development Specialists," by U. S. Department of Labor Bureau of Labor and Statistics, 2014; "Summary Report for: 25-9031.01 – Instructional Designers and Technologists" U. S. Department of Labor Employment and Training Administration, 2013; "Summary Report for: 13-1151.00 – Training and Development Specialists," U. S. Department of Labor Employment and Training Administration [O*Net], 2014

States), it provided a valuable glimpse into the pent-up demand for instructional designers and developers around the world. The key finding was that instructional design is a growth field (BLS, 2014; O*Net, 2013; O*Net, 2014).

1.2 Wage and Salary

Wages listed on Table 23.1 range between \$26 to \$30 (USD) an hour or \$52,000 to \$60,000 (USD) annual, a modest mid-range wage. The rates quoted represent full-employment rates rather than consulting rates. However, the narrow range indicated a lack of career advancement opportunity, as well. In addition, the wide range of role titles may have skewed the average upward by including executives in an essentially professional practitioner role.

1.3 Education Expectations

Education expectations in Table 23.1 specified a baccalaureate degree as the minimum requirement for these roles and that postulated that masters and doctoral degrees are more common. However, anecdotal field knowledge garnered from focus groups and interviews of TI*f*PI's team members indicated that many current role incumbents come from other fields without degrees or come with degrees specific to their field of expertise (e.g., nursing, sciences, engineering, finance, business, P-20 education, computer science, and so on) rather degrees related to adult learning or instructional design.

Likewise, team members cited significant experience with employers who prefer instructional designers with specific business sector experience (e.g., finance, energy, government, etc.) or in the use of company products such as specific software, equipment, or processes. Competent instructional designers work well across industries; however, employers' preference appeared to indicate an overall lack of confidence in instructional designers as professionals.

Anecdotally, these same employer preferences seemed helpful to subject/content experts with a talent for teaching and who moved into instructional design. Using their field-specific knowledge as the key to open the door to course design and development, lateral movers were able to enter the instructional design and development field with little or no formal preparation, but a strong passion for the field and talent for communicating knowledge and building skills in others. It was noted, that many came into instructional design and development through classroom teaching, coaching, or experience building key pieces of learning solutions (e.g., video, graphics, software programming, etc.)

Informally and anecdotally, expert practitioners estimated that *around* 20–30 % of the field has adult education/instructional design/learning technology degrees. This informal estimate contrasted sharply with the O*Net estimates of degree types shown in Table 23.1. The variance was attributed to the (anecdotal) observation that many instructional designers and developers do hold advanced degrees in their field of expertise, but not in instructional design and development. The O*Net statistics only listed the level of degree not the field in which the degree was taken.

Historically and even today, lateral movers in instruction design are essential and valued role incumbents. However, the difference between degreed incumbents and non-degreed incumbents indicated that degrees cannot be defined as the competence standard for the field.

1.4 Career Advancement and Role Titles

Anecdotal evidence indicated that, for many lateral movers, an instructional design and development position constituted a significant promotion. Meanwhile, degreed and experienced instructional designers struggled to find effective career paths within the field. As noted in Wages and Salary, the experienced instructional designers of both backgrounds faced capped wages that pitted years of experience against lower-priced incoming and often offshored or self-attested talent.

One indicator of the career advancement conflict appeared in the job title listings in Table 23.1. The Instructional Designer and Technologists role titles included Chief Technology Officers, but not Chief Learning Officers. They showed Directors of Educational Research and Product development, but not Directors or Managers of Learning and Development or Training functions (for which there is a different role designation and information). Then, the Training and Development Specialist role included E-learning Specialists as job title, which created some dissonance for many E-learning Specialists who consider themselves Instructional Technologists.

Overall, the publicly available labor role information promoted by US government sources reflected the role confusion and conflicts that exist amongst practitioners and their employers and clients. The publicly available role information indicated instructional designers have the potential for moderate-income plus an increasing demand for services, which should result in increased wages. However, anecdotal evidence indicated that there continues to be a high degree of uncertainty about who really has the expertise, which in turn limits movement and income potential.

1.5 Market

Content analysis of job descriptions identified several marketplace issues. This was a general overview with key summative generalizations including:

- Job descriptions posted on career boards read like boilerplates of each other with an emphasis on tools and processes rather than on design and development.
- The list of requirements in these positions is often excessive, leaving candidates wondering whether the employer knows anything about the work of instructional design.
- Wages are seldom publically acknowledge; candidates must work through several layers of the application process before they are privy to the salary for that position.
- The preferred candidate has 3–5 years of experience. Few, if any, request 1–3 years of experience. A few, listed as "senior" level, require 7–10 years of experience. This leaves the newest members of the field unable to enter the field. It also leaves the most experience members of the field unable to change employers or redeploy after layoffs.
- Years-of-experience requirements leave the (incorrect) impression that years of employment equals quality of work.

Altogether, it was determined that the US employment market was (and continues to be) exceptionally disorganized. The lack of long-term career options and market-capped wages hidden from applicants did not support the premise that this role is in demand and will continue to be a growth field for the near future.

While every sector of business requires instructional designers, experienced practitioners indicated anecdotally that many employers and clients prefer instructional designers with field knowledge. They felt that the skills involved in creating high-quality learning solutions were valued less than the expert knowledge of the field. Apparently, when instructional designers are valued for their field expertise first and their expertise in meeting learner needs second, there was a sense the instructional designer as a professional was devalued.

Other market factors identified include:

- Off-shoring: This practice created savings by hiring practitioners at internationally lower rates and has contributed to narrow and capped wage scale. It also increased the availability of self-attested instructional designers with minimal skills.
- Commoditization: Off-shoring together with the disorganized US marketplaces has created *commoditization* of the instructional designer, where individuals are valued as interchangeable regardless of skill level.
- A more international and multicultural workforce: Increasingly, employers seek instructional designers with experience working in multiple cultures and language and willing to travel.

Considering all the elements, it was clear that the US employment market is fragmented, diverse, and chaotic and that instructional designer practitioner experience the effects of commoditization which creates a lack of differentiated between the competent and incompetent. Clearly, instructional designers and developers and their employers and clients, all struggled with the lack of clarity about what instructional designers work is. However, the learner, who may receive lower quality services due to a commoditization and confusion about instructional design quality, may feel the ultimate impact.

1.6 Standards

Today, few standards exist within the field of instructional design. When asked to describe standards, both the practitioners and the leaders who hire them discuss development processes (ADDIE, SAM, Lean, Agile) and technology expertise (use of specific brands of authoring tools, learning management systems, graphics development tools). While an organization's choice of development processes and tools affect solution quality, competent instructional designers move easily between these processes and tools. Neither processes nor tool experience constitutes the practice standards used by all instructional designers and developers.

1.7 Theories and Models

A variety of theories and theorists infuse the instructional design field with expectations that frequently conflict with one another. Consider the clash between behaviorist and constructivists, as one example. Many theories and models are very effective; few are mutually exclusive. Competent instructional designers learn continuously and learn to apply new theories and techniques that better serve their ever-changing audiences' and needs. The truly expert instructional designer chooses the right set of theories, models, and tools to apply in any given situation. In addition, any two instructional designers approaching the same situation may choose different theories, models, and tools to accomplish the same goal. Both could be successful. In instructional design, there is no "one right design."

Any one set of theories or models does not provide sufficient guidance to create practical field standards that work across organizational, institutional, geographic, or philosophical boundaries. Without clear standards, the field flounders.

Overall, the lack of standards devalues the role of instructional designer and affects both practitioners and employers or clients. In the end, it is the learner, downstream from the hiring decision, who is most affected by employment selection processes that hire inadequate instructional design skills.

2 The Need: The Foundation for a Practice Analysis Study

The pre-work for the practice analysis found that the lack of clarity in instructional designer's role expectations and role standards creates:

- Role confusion
- Difficulty matching the right skills to the work—a difficulty experienced by both the instructional designer and their employer or client
- Commoditization—the selection of worker based on lowest cost rather than on the quality of work
- A focus on tools rather than skills or quality
- The probability that, under these conditions, employers experience a wide range of results in the quality of learning solutions delivered and the ultimate client, the learner, has an equally dramatic range experiences.

The need, then, was to provide a framework that will validate professional instructional design and development skills as they are practiced competent practitioners.

2.1 Strategic Decision: Certification vs. Microcredentials

Given a need definition, TI*f*PI considered whether to drive out a full certification for instructional designers or approaching the field with microcredentials with digital badges. Microcredentials validate competency in one or more discrete performance areas (Badge Alliance, 2014). As such, a microcredential can be specialty certification.

Due to the market fragmentation, role confusion, and the lack of differentiation among skillsets, TI*f*PI chose to explore the microcredential path as the opportunity with the greatest promise for building and validating capability among instructional designers and developers with diverse and varied backgrounds and workplace experiences and toolsets.

Stackable microcredentials could be organized either around development ladders of advancing skill levels or around patchwork areas of complimentary credentials, as shown in *Fig. 23.1. Microcredential Deployment Models*. Both the developmental ladder model and the patchwork model of microcredentialing provided opportunities for adding credentials and leveling up to more advanced credentials.

Patchwork microcredentials provided the best match to the known need. Since field practitioners already bring significant experience in specific skill sets, forcing a development ladder of skills was deemed to be least appropriate and a patchwork of complimentary credentials based on different types of learning solutions was deemed to be most appropriate.

Patchwork microcredentials can level up to a pyramid-style career path models of advancement that are flexible based on combinations of similar skills and experiences demonstrated as two or more defined combinations of patchwork-style microcredentials. TI*f*PI chose to implement patchwork microcredentials with the intention of build toward the pyramid career path model over time.

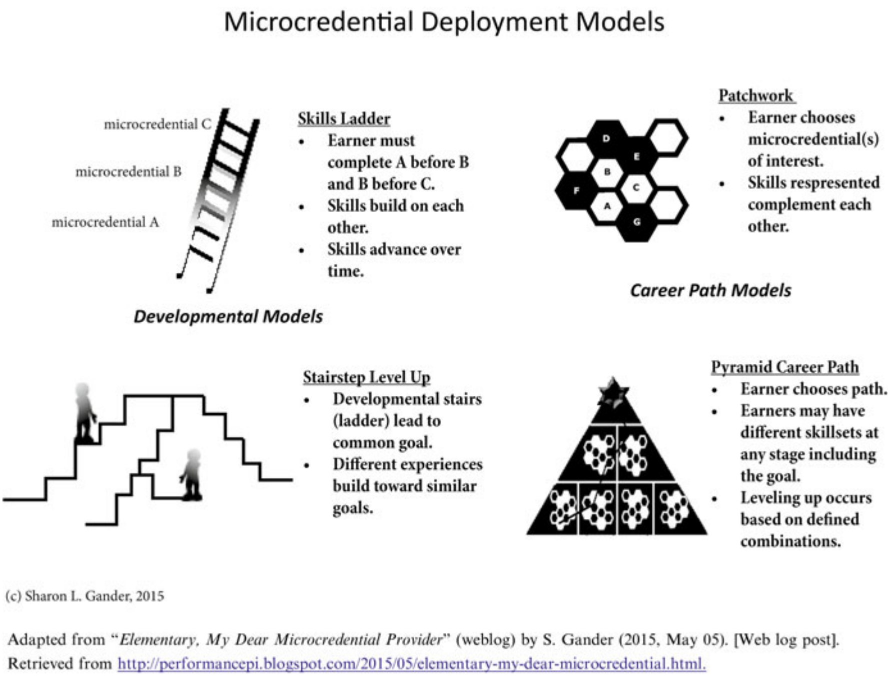


Fig. 23.1 Microcredential Deployment Models. Adapted from "*Elementary*, *My Dear Microcredential Provider*" (weblog) by S. Gander (2015b, May 05). [Web log post]. Retrieved from http://performancepi.blogspot.com/2015/05/elementary-my-dear-microcredential.html

2.2 Standard Setting: Model-Free (Agnostic)/Theory-Free (Agnostic) Standards

TI*f*PI wished to develop credentials that allow all professional instructional designers to demonstrate competence that gets results regardless of development methodology or theory. Since TI*f*PI promotes evidence-based credentialing, this led to the creation of a model-free, or at least model-agnostic and theory free (theory-agnostic) approach to standards.

Therefore, the second strategic decision was to look for a model-free (or agnostic), theory-free (agnostic) approach to defining standards for credentialing instructional designers and developers. The practice analysis provided a method for achieving this goal. An explanation of the practice analysis to process follows.

3 The Practice Analysis

A practice analysis is an alternative to the job-task analysis when role incumbents work in many different venues with a variation in resourcing, process methodologies, and regional influences. The practice analysis starts with a review of key documentation and is followed discovery process that generates role-wide agreement on the common work elements and quality expectations through alternating expert-focused discovery with field-wide focused discovery (Hale, 2012).

3.1 Process

A job, task, practice, or cognitive analysis is a foundational step in the Hale 12-step process. This study describes the work of the practitioner and set standards through iterative data collection, feedback, and refinement. The instructional designer micro-credentials practice analysis project (known as the ID Badges Project) included:

1. Document review that analyzed adult learning theories to identify common terms
2. Focus group of experts to:
    a. Validate findings from document review
    b. Identify missing items
3. Survey of experts to identify domains used by experts
4. Focus groups of instructional design experts to refine domains into standards
5. A criticality analysis survey of the broader field to validate refined standards
6. A small group of internationally experience experts to refine performances within standards

Results of the criticality analysis survey guided development of microcredentials supported by digital badges (Gander, 2014).

3.1.1 Literature Review to Standard-Setting

While much practice analyzes start with a review of job descriptions and work manuals, in this case, the job descriptions were known to be ineffective and there were no work manuals. However, there was field theory—more than 100 years of field theory—and theories that conflicted with each other. Amongst the profusion, some theories directly contradict others and some discredit earlier theories, while others support and even expand upon previous theories. Therefore, it was determined that a literature review was necessary. The literature review abstracted key terminology of theorists representing a range of theoretical perspectives as shown in *Table 23.2*. The objective of this review was to identify the key phrases that each theorist used to explain the components of their theory.

Content analysis abstracted 25 key terms with some overlap. An internal group of expert instructional designers participated in a focus group that discussed the meaning of each term. This group narrowed down the list and refocused some of terminology to more contemporary terms formulated as potential field standards.

Table 23.2 Theorist reviewed

Theorist	Theory	Classification	Source
Bruner	Cognitive Scaffolding	Behaviorist	Foshay, Silber, and Stelnicik (2000)
Gagne	9-Events of Instruction	Behaviorist	University of Florida Center for Instructional Technology & Training [CITT] (2014)
Kopfler	Gaming and social media learning theories	Social Learning	Jenkins (2008)
Merrill	First principles of instruction; pebble-in-the-pond scenario-based learning theories	Eclectic/Centrist	Merrill (2002)
Pike	7 laws of learning theory	Behaviorist	Principles of learning (2015)
Rossett	Blended learning theory	Eclectic/Centrist	Allison Rossett, (n.d.)
Shank	Case-based learning theory	Constructivist	Case-Based Reasoning (2015)
Shank	Goal-based learning theory	Constructivist	Thomas, (n.d.)
Snyder and Wilson	Augmented Learning theory	Constructivist	Synder and Wilson (1997)

Adapted from *Instructional designer/developer practice analysis and survey results* by S. Gander, 2014 (pp. 25–29). Retrieved from www.tifpi.org

This expert group then responded to a survey about how they applied these theory-related terms to their work. They were asked:

- Which 3–5 do you use every time?
- Which 3–5 do you expect to see in others work?
- Which 1 would you ask another instructional designer to put back in, if it were missing from their work?

Survey results narrowed the list to 11 emerging domains used with very high frequency among these expert instructional designers.

A small group of instructional designers, the ID Badges Project Team, worked through a series of discussions to refine and clarify these key terms into standards that included the key term as a domain name. They added definitions, performances, and rubrics in order to create strong standards. In doing so, the team identified several terms that overlapped each other, so they narrowed down the list again.

Nine strong standards emerged describing the work of the competent instructional designer as one who:

- Addresses sustainability
- Aligns solution internally and externally
- Assesses performance
- Collaborates and partners
- Elicits performance practice
- Engages the learner
- Enhances retention and transfer
- Ensures context sensitivity
- Ensures relevance

3.1.2 Criticality Analysis: The External Survey to Validate Standards

These nine standards became the core of the criticality analysis survey sent to an international audience. Survey participants came from TI*f*PI's membership list, Practice Leaders' extended list of cohorts, announcements in LinkedIn discussion groups, and individuals attending The International Society for Performance Improvement's annual conference 2014.

Sixty-seven survey participants were asked to define their years of experience and their *current* role:

- Academic—college level research and/or teaching adult education, instructional design or instructional technology
- Graphic artist
- Instructional Designer
- Instructional Developer
- Instructional Technologist
- Instructor (trainer)
- Learning Function Executive

- Learning Function Manager
- Learning Project Manager
- Programmer of learning solutions
- Social Media Expert
- Student in adult education, instructional design, or instructional technology
- Subject content expert
- Videographer
- Other (please specify)

They were also asked to identify:

- Which roles they had held in the past
- Which types of learning solutions they had developed from a list of 17 types of learning solutions.

Most importantly, participants rated the importance, difficulty, and frequency with which each of the nine standards were done based on their own experience.

The results of this criticality analysis survey follow.

3.2 *Overview of Survey Results*

Results indicated a very high level of congruence between participants.

3.2.1 Roles

First, the survey respondent mix included individuals that represented all of the roles spread among the respondents. Multiple respondents were holding all roles at the time of the survey. In addition, the respondent mix also represented all the roles at some time in their past. Interestingly, those who self-identified as Instructional Designers today, identified themselves as having been Instructional Developers, Instructional Technologists, or Instructors (along with a mix of other roles) in their past. Likewise, individuals who self-identified as Instructional Developers, Instructional Technologists, or Instructors today also listed Instructional Designer as one of their past roles. Therefore, instructional design, as a field, incorporates all roles doing some combination of the core functions and standards as they participate in designing and developing effective learning solutions.

3.2.2 Years of Experience

The large number of roles held by survey respondents might be viewed as a skewed perspective of the field, if respondents all had significant experience, as well. More than half of the respondents (55.2 %) described themselves as having more than

10 years of experience. Respondents with less than 5 years' experience and respondents with 5–10 years' experience were equally distributed at 22.4 % each. While experience groups were not equal, the survey population was random enough for TI*f*PI to conclude that this experience-base reflected the current ID field's experience, which is heavily tilted toward more experienced employees.

3.2.3 Standards

The results of the criticality analysis, *Table 23.3*: *Criticality of Instructional Design Standards*, showed that all standards received moderately high to very high ratings on all three criticality scales—importance of the standard to the work, the frequency with which the standard was used, and the difficulty of the work in that standard. The scale was one to four (1–4) with "1" as very low, "2" as low, "3" as moderate, and "4" as high. The lowest was 2.67 and the highest was 3.9. Standard deviations between domains within a criticality group were between .20 and .35. The range was between .62 and 1.11.

The standard "ensures context sensitivity" received the lowest ratings across the scale. It could have been identified as a lower value domain. However, the overall narrow range and deviations indicated a strong agreement between participants on the criticality of all domains. Therefore, the team decided to treat *all* domains as equal with no domain requiring a higher level of performance demonstration or larger amount of evidence support than other domains.

The domain "ensures relevance" has been identified as missing from Table 23.3. This was a quality assurance oversight. The questions related to this domain were missing from the criticality survey. However, the tight alignment between domains and within domains allowed the team to extrapolate that this domain would receive similar ratings. It will be reassessed in the next round of analysis.

Table 23.3 Criticality of instructional design standards

Standard	Importance	Frequency	Difficulty
Addresses sustainability	3.67	3.27	3.47
Align the learning solution	3.93	3.67	3.28
Assess performance	3.86	3.59	3.35
Collaborate and partner	3.81	3.69	3.33
Elicit performance "practice"	3.68	3.48	3.32
Engage the learner	3.71	3.43	3.48
Enhance retention and transfer	3.82	3.78	3.44
Ensures context sensitivity	3.00	2.67	2.86
Mean Across Domains	3.69	3.45	3.32
Standard Deviation between Domains	**0.29**	**0.35**	**0.20**
Range	**0.93**	**1.11**	**0.62**

Adapted from *Instructional designer/developer practice analysis and survey results* by S. Gander, 2014 (p. 17). Retrieved from www.tifpi.org

Surprisingly, respondents indicated that they had created an average of eight different learning solution types. Combinations of learning solution types, however, were as unique as the survey participant's backgrounds. Therefore, it was possible to extrapolate that all nine standards are used in the creation of all 17 learning solution types:

- Asynchronous (authored) Elearning
- Blended learning
- Coaching/Mentoring
- Community of Practice
- Electronic Performance Support
- Goal-based/problem-based scenarios
- Informal Learning
- Instructor Led Training
- Job Aids
- Learning Games (Serious Learning Games)
- Learning Videos
- Mobile Elearning
- Reusable learning objects (RLOs, a.k.a. micro learning objects)
- Self-study
- Simulations
- Social Media
- Synchronous Elearning

Given the breadth and depth of the criticality analysis, the team took a generic approach to the design of the microcredentials by requiring that each microcredential applicant: (a) define their solution type, (b) provide a project overview, (c) respond to questions about the design and development process for that project, and (d) provide a limited set of exhibits demonstrating each of the nine standards.

Since each learning solution development project provides opportunities to exhibit many, but not all, of the performances in each standard, the team built rubrics that defined the number of performances required for minimally acceptable and outstanding level of demonstration. The microcredentials offer two levels of certification—standard and gold plus.

4 Building the Microcredential Series

4.1 Governance and Administrative Processes

With a clear list of standards and performances plus a list of learning solution types that would become the microcredentials, the team tackled developing governance and administrative procedures including:

- Setting up eligibility and maintenance requirements
- Defining exceptions and appeals processes

- Setting up the application process
- Testing the process with Alpha and Beta tests

Eligibility requirements were set to encourage participation by individuals with minimal experience. However, since this is an evidence-based credential, some experience is required. Minimal experience was set at 18 months based on a self-attestation to working in the field for that length of time.

Requirements included submission of an attestation of work from a client or supervisor (instructor attestations not accepted), an application form with self-reflection for a specific project, project evidence examples, and the fee. Evidence examples were limited to nine small snapshot-type examples (The Institute for Performance Improvement [tifpl], 2014). The purpose for the snapshot evidence was twofold. First, this requirement caused candidates to focus on the points they wanted to present; they could not hand off masses of documentation and assume that reviewers would find the right evidence "somewhere in there." Secondly, it provided both candidates and TIfPI with intellectual property rights protection; the small snapshots chosen could be selected to avoid proprietary information or, where some proprietary information was disclosed, it would not be enough to cause concern.

Credential maintenance was required. In this instance, maintenance requirements varied depending on the individual's career goals. One type of career goal identified specialization in one specific type of learning solution. However, data from the criticality analysis also indicated that the majority of instructional designers and developers created many types of learning solutions. Therefore, two maintenance paths were developed—continuing education points for those who specialize and the addition of another microcredential for those who chose breadth of experience.

With key design decisions in place, it was time to move into governance decisions. The exception and appeals processes were defined. Exceptions allowed the application process administrator to make sensible decisions in a timely manner. Since TIfPI already administered other credentials, an appeals process was in place and could be trigger for microcredential appeals, as well.

With eligibility, requirements, exceptions, and appeals defined, application and administration process definitions began. Here, workflow activities were defined from key viewpoints—applicant, process administrator, application reviewer, and webmaster.

It was time to test those processes and roll out the microcredentials. Since alpha testing is a test of process and tools, the ID microcredential alpha test included a review of the applicant handbook and application submission by three individuals who documented their experience with the process and their concerns. Based on alpha test feedback, documentation was modified before starting the Beta test.

With an evidence-based approach to microcredentialing, the beta test focused on reviewers. Comments were solicited regarding the quality of information reviewers received from applicants and on reviewers' ability to make consistent decisions.

The alpha and beta tests resulted in the award of eight microcredentials with badges as well as the modification of associated documents such as the handbook, the application form, and the administrative process documents. They also started the collection of extant data such as reviewer turn-around time, inter-rater reliability, candidate status, and badge hits.

The cumulative efforts of business needs definition, practice analysis, and criticality analysis resulted in the design and development of 17 learning solution microcredential certifications with digital badges for instructional designer and developers. These microcredentials rolled out April 2015.

5 Marketing: Attracting Professions to Badges

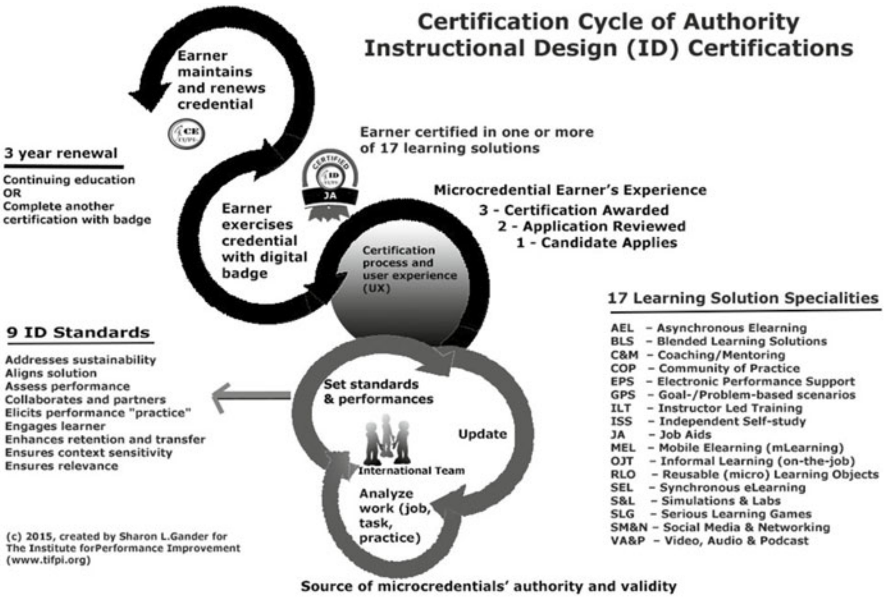
5.1 Issues in Messaging Microcredentials and Badges

As TI*f*PI rolled out 17 microcredentials with badges, they discovered the realities of a marketplace where microcredentialing is not a clearly defined field. In the adult credentialing marketplace, badges and 'badging' appeared clear on the surface, but were often unclear to potential earners and consumers. TI*f*PI quickly moved away from either term—microcredential or badge—in favor of the phrase 'certification with digital badge'. This phrase appeared to resonate better with professional candidates and employers.

In order to communicate the foundations and authority of these microcredentials, the infographic shown in *Fig*. *23.2*: *Certification Cycle of Authority* was developed showing the roots of the credentialing process, the standards, the microcredential types, earner's credentialing process, and renewal. The diagram balances the process of credential creation with credential earning, but emphasizes the authority behind the microcredential and badge.

At the time of writing, TI*f*PI is in the early phases of marketing microcredentials and has discovered several truths about marketing these credentials:

- Marketing microcredentials is a significant work stream in and of itself.
- Like all marketing, messaging microcredentials and badges requires congruence between imagery and wording.
- The public promise of work, work quality, improved pay, and improved professionalism are not clearly actualized at the time of roll out. It may be years before these promises can be proven.
- Marketing also requires a clear definition of the market. In the case of instructional designers and developers, the market is fragmented; it is difficult to reach individual instructional designers and developers in B2C (business to customer) marketing. It is just as hard to reach their employers who might be reached either B2C or B2B (business to business).
- Reaching the marketplace requires significant effort, staffing, resourcing, and time.



Adapted from "*Instructional Designer & Developer Certification Infographic*" by S.Gander, 2015. Retrieved https://tifpi.wildapricot.org/IDBadges.

Fig. 23.2 Certification Cycle of Authority. Adapted from "*Instructional Designer & Developer Certification Infographic*" by S. Gander, 2015a. Retrieved https://tifpi.wildapricot.org/IDBadges

The first round of messaging merely introduced the availability of microcredential certifications with badges using a 'promote yourself' message. Here messages focused on ways that individuals could distinguish themselves with certifications and badges that could support their own communications with clients and supervisors. The intent was to find the pioneers, who would choose credentials because it was new or because they liked the idea of digital badges in social media.

The second round of messages drove home the leading edge nature of these credentials with messages such as 'stand out in crowd' and 'show your leading edge talents'. This was backed by a drive to reach specific employers who wanted their group of instructional designers and developers to 'stand out' and to show that they worked to standards.

The third round of messages is in planning at the time of writing; it will be directed toward polishing ones professional image, creating a conversation with clients and supervisors about workmanship, and building employer backing.

Post-rollout interviews with stakeholders has identified an emerging message that "the learner" (the indirect consumer) is one most damaged when instructional design and development is done poorly. This is a message that consultants and consultative instructional designers can carry to their clients. This is also a public promise that is difficult to measure; however, TI*f*PI is working on defining measures of learner success.

At this time, marketing is mainly focused on the US market with some collateral messaging to international organizations who see a need for standards across their borders.

5.2 *Overcoming Resistance to a New Credential*

As with all new credentials, there is resistance. Practitioners do not see a reason to become credentialed. They have work; their world is fine as it is. They want to know that employers prefer or require the credential, today. Since new credentials cannot provide this assurance, these practitioners are reluctant to take the time, effort, and finances to step up to a new credential.

As experienced individuals with market cachet share testimonials about their newly minted credential and their experience in applying for that credential, others begin to show an interest. However, like any other change project, the transition takes time.

Another type of resistance that the instructional design microcredentials are experiencing comes from the employer or client. In this case, employers and clients have driven the market for instructional designers. The have dictated the type of work available to instructional designers (and the work that instructional designers are not encouraged to do—particularly front-end analyze and back-end evaluation in contrast to their own preferred development models), the choice of tools that instructional designers use, and the end-product quality. Since the vast majority of employers and clients are unsophisticated in the art and science of instructional design and adult learning, their decisions tend to be based on resourcing of the instructional design project—on the funding, availability of subject experts, availability of specific tools, and on the timing of outputs. Their concept of product quality may be less related to meeting design standards or creating learner successes than meeting delivery dates and budgets.

6 Future Direction for ID Certifications with Badges

At writing, the Director of ID Certifications at TIfPI is currently researching the public promises created by credentialing instructional designers.

The traditional promises of employability and higher wages are difficult to show at the beginning of a credential's life cycle. Therefore, she is using testimonials from new earners of instructional designer microcredentials to highlight immediate impact while researching longer-range impacts. Anecdotally, these newly certified instructional designers are able to share their individual experiences and outcomes from participating in the credentialing process; they are able to describe the impact that completing the application had on their own attention to their design work and resulting quality.

Additional research is being initiated on the expectations of learning and development leaders, instructional design and development practitioners, and instructional design degree program instructors and students. This research is expected to clarify both the next round of messaging for the certification program and the next round of microcredential certifications to be developed. TI*f*PI has plans to create additional microcredential certifications in the following areas:

- Front-end analysis (e.g., job/task analysis, practice analysis, cognitive analysis, business needs assessment, user requirements analysis, and so forth)
- Design documentation (e.g., strategic/conceptual design, detailed design, scriptwriting, assessment design, user requirements, and so forth)
- Analytics and Assessments (e.g., pragmatics, decision trees, item writing, setting pass scores, testing assessment tools, evidence-based assessments, and so forth)

As additional microcredentials materialize, the opportunity will emerge to stack credentials and 'level-up' practitioners who demonstrate expertise in multiple areas of the field. For example, individuals who add front-end analysis and analytics microcredentials may be offered the opportunity to level up to a Learning Analyst credential. The intent is to use stackable microcredentials to generate career paths and the opportunity for expert instructional designer to show their individual career development history along with their breadth and depth of experience.

7 Conclusion: The Impact of Microcredentials on IDs

The Institute for Performance Improvement (TI*f*PI) approached the instructional design and development field with an open-minded perspective that lead to building microcredentials that could be marketed to an international, multi-industry, diverse, and very segmented market where instructional designers and developers have become commoditized and have never fully developed their worth as professionals. The newly minted instructional design and development microcredential certifications with badges has opened the field to a greater discussion about the wide range of complex skills and expectations for instructional designers and developers.

At this time, these evidence-based microcredentials with digital badge allow earners to use examples of work already performed as evidence of quality work production to standards. The defined standards defined through a practice analysis transcend learning theories, instructional design models, variability in leadership or client preferences, market segment and industry variations, and geographic differences. These standards describe how competent instructional designers and developers measure their own work. The standards and related credentials provide professional practitioners with an essential tool for driving conversations with clients and leaders about the difference their makes for the ultimate client, the learner.

TI*f*PI has positioned the learning solution development microcredential certifications with badges as a performance-based entry to the instructional design field. Additional microcredentials are planned and are expected to provide career path direction to the field. With the advent of additional badging areas, TI*f*PI plans to develop intermediate and advanced levels of credentialing that allow practitioners to show their development and build a truly professional field of practice, regardless of the educational foundation that started their ID journey.

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Chapter 24
Student Perceptions of Digital Badges as Recognition of Achievement and Engagement in Co-curricular Activities

Ian Glover

Abstract The Sheffield Business School at Sheffield Hallam University has provided paper certificates of recognition to students who act as peer representatives for many years. However, the overhead of staff time in creating and distributing these certificates and the cost of printing them has become increasingly prohibitive. While this peer representative scheme is not part of the students' formal studies, the students place a significant value on having some formal recognition of their participation, therefore an alternative method was sought. Open Badges were introduced as a replacement for the paper certificates and research was undertaken to discover the students' impressions of the badges in comparison to the previous paper certificates. The research took the form of an anonymous survey, containing both quantitative and qualitative elements, sent to all students who took part in the peer representative scheme. The research confirmed the hypothesis that university students primarily view digital badges as a way to promote their achievements to potential employers, however further research is suggested to determine the extent to which potential employers understand and value badges as evidence of achievement. This chapter also provides background to the project, details the technical choices made when introducing digital badges and offers some insight into how digital badges can support and encourage participation in co-curricular and other informal learning activities.

Keywords Digital badges • Co-curricular • Informal learning • Recognition • Reward

I. Glover (✉)
Sheffield Hallam University, Floor 1, Oneleven, 1-11 Arundel Gate, Sheffield S1 2PN, UK
e-mail: i.glover@shu.ac.uk

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1 Introduction

Badges as a mechanism to reward and recognise experience and personal development have a long history, with perhaps the most well-known example being that of the Scouts and Girl Guides movements in many countries (Halavais, 2012). Such badges are typically a visual indicator whose meaning is understood by, as a minimum, the members of a specific community and serve to both identify the wearer as a fellow member of the community as well as give some indication of their experience and standing within it (Antin & Churchill, 2011).

The potential motivational effects of reward and recognition mechanisms has led to growing interest in the use of badges in formal and informal learning situations (Glover & Malone, 2014; Grant, 2014; Ostashewski & Reid, 2014; Gibson, Ostashewski, Flintoff, Grant, & Knight, 2015). However, it is important to understand that such mechanisms, while they are motivating to some people, may have no effect on some and a demotivating effect on others. Rewards such as badges, or recognition methods such as leaderboards, provide a source of *extrinsic* motivation, that is, motivation for external reasons, such as the ability to brag about an achievement (Filsecker & Hickey, 2014). Such extrinsic motivation has been found to have a demotivating effect on those who with high *intrinsic* motivation to undertake an activity, such as those wishing to learn a skill for their own interest or purpose (Deci, 1971). In addition, Abramovich, Schunn, and Higashi (2013) found that a badge's type (*participation* or *skill*) had an influence on its motivational effect on potential earners—that is, some badges can provide greater encouragement than others on particular learners. The use of digital badges therefore fits particularly well with gamification projects, especially those that seek to reinforce positive, desirable behaviours (Anderson, Huttenlocher, Kleinberg, & Leskovec, 2013). Gamification is the practice of introducing elements from games, particularly computer games, to motivate people to work in specific ways and undertake less desirable tasks (Glover, 2013). These elements generally range from leaderboards, where participants are ranked according to their relative performance against a set of criteria, to publically visible rewards for successfully meeting specific requirements. However, for some individuals, gamification can have a significant negative side-effect of discouraging moving onto new materials and activities because the individual hasn't yet 'won' the earlier 'rounds', e.g. they haven't topped the leaderboard (Glover, 2013). Badges may offer a way to provide a tightly bounded set of 'win criteria' that provide greater encouragement to earners to move onto other tasks than more open-ended mechanisms.

Easley and Ghosh (2013) also highlighted that it is necessary to identify the appropriate balance between the desirability of a specific badge and the effort required to earn it. This suggests that badges can be viewed by some as status symbols, with hard-to-earn badges showing significant knowledge and commitment, whereas, for others, badges are something to collect, so a large number of (probably low-effort) badges is preferred. One factor in this may be the age of the earners, with younger earners using badges more as a collection and older earners using them to show depth of knowledge, specialism, and as a differentiator between peers (Glover & Latif, 2013). In spite of this presumption that badges are primarily a mechanism for an individual to share their achievements with others, Denny (2013) found that, even when there is no mechanism to share badges, they could still provide benefits to learners by affirming personal development and understanding.

University students approaching graduation often express that they desire a way to differentiate their skills and experience from those of their peers, including those on their specific course as well as all other graduates who have entered the job market shortly before or after them (Glover & Latif, 2013). Digital badges, with their potential to motivate people, the flexibility in which they can be created and awarded, and the ease with which they can be shared with other interested parties, have been identified as being particularly suited to use by earners to evidence employability skills and experience to prospective employers (Law, Perryman, & Law, 2014; Olneck, 2015). However, as there has been little research into how digital badges are perceived by employers, it is currently unclear whether badges would actually address this need, particularly when established mechanisms such as certificates already serve this purpose.

2 Project

For over 10 years, Sheffield Hallam University's Sheffield Business School (SBS) has offered a development programme for students wishing to represent their peers in discussions with teaching staff and university management. The programme operates in a co-curricular fashion, meaning that, while there is a clear relationship to the participant's formal study with SBS, the programme runs parallel and separate to the students' formal studies. As a result of being an additional, voluntary activity, in addition to the intended purpose of assisting fellow students, participants often see this programme as a way to increase their desirability to potential employers. Therefore, due to the importance that participants place on this ability to evidence their development, paper certificates have traditionally been issued to those who complete the programme.

Yet, despite the significant cost of producing these certificates and their reported importance to participants, a relatively high proportion were never collected by the earners. Additionally, in recent years, due to the increasing use of online professional social networks and digital application processes, there have been increasing requests for evidence that can be easily shared electronically. A flexible method was also desired by the programme team to enable them to recognise participants who have made a truly exceptional contribution to the programme with a personalised award. Therefore, a new mechanism was sought that would reduce some of the costs involved in the production of certificates, but that would also give greater flexibility to earners to use them as part of their professional online profile and to the programme team to issue special awards to individuals.

The programme team felt that digital badges would meet these requirements and wished to pilot badges with the 2014 cohort of student representatives. The author assisted the team in developing a suite of badges, using the Credly (http://www.credly.com) platform, to represent participation in, and development through, the training opportunities provided as part of the programme. This platform was selected for the project due to its relative maturity compared to other online badging platforms, its interoperability with the Mozilla Open Badges de-facto standard, and its provision of a comprehensive badging environment, incorporating badge creation, issuing, receipt and sharing.

Badges were issued to students as a direct replacement of the paper certificate that would previously have been issued. The original intention was to inform students of this change at the start of the programme, along with general information about digital badges and ways in which they can be used to support learning and for self-promotion. However, for this initial pilot, administrative issues for the programme team meant that the students were not informed about the badges until they were awarded. The primary issue was due to an unanticipated delay in obtaining senior approval for the use of badges on the programme, meaning that it was not possible to inform the students until the programme was already drawing to a close.

Figure 24.1 shows some of the distinct designs used for the badges, with each badge featuring a relevant image, a title and reference to Sheffield Hallam University and the Sheffield Business School as the awarding body. As the programme team expected the recipients to share their badges with third parties, a distinctive design for each badges that prominently displays the name of the institution was deemed to be important both as a way of adding credibility to the badges and also as a way to promote the programme to other students.

2.1 *Hypotheses*

At the start of the project, and based on the author's prior research (Glover & Latif, 2013), three hypotheses were made regarding the use of digital badges in this project:

Fig. 24.1 Examples of badges created for the project (https://credly.com/u/12304)

H1: Students see badges as a way to differentiate themselves from peers.
H2: Badges motivate some students to complete existing or undertake additional work.
H3: Students want badges that represent all aspects of their studies, including both formal and semi-formal learning.

2.2 Method

An anonymous, voluntary online survey was created by the author and sent by the programme team to the 89 participants enrolled in the programme after the badges had been issued. As this happened at the end of the academic year, the survey remained open for 1 month to allow participants time to collect and share their badges, should they wish, prior to responding. The survey used a combination of quantitative and qualitative questions and the data was analysed by the author, including a thematic analysis of the qualitative data for each question.

3 Results

Of the 89 students who took part in the programme, 46 (52 %) submitted a response to the survey. Of these 46 respondents, 57 % (n = 26) reported claiming their badges while the remaining 43 % (n = 20) stated that they had not, at the time of responding, claimed theirs.

The 26 respondents who reported claiming their badges were asked whether they had shared their badges with others, with 73 % (n = 19) reporting that they had. The professional networking site, LinkedIn, was by far the most common method that the participants used to share their badges (89 %, n = 17), while a significant minority shared their badges through the more personal social network, Facebook (37 %, n = 7). Email (11 %, n = 2) and Twitter (5 %, n = 1) were not significant avenues for sharing badges. When asked about the response to the badges that they had shared, 47 % stated that the response was either very positive (n = 5) or quite positive (n = 4), while the remaining 53 % (n = 11) reported a generally neutral response or no reaction. In addition, 16 responses were obtained regarding the groups that the badges were shared with (a single response could include multiple groups): 63 % (n = 10) targeted potential employers, 75 % (n = 12) friends and family, 19 % (n = 3) fellow students, and 13 % (n = 2) shared their badges with staff at the university. There was a strongly positive response to the question of whether the respondents would share badges with the same groups again, with 82 % (n = 14) of the 17 respondents stating that they would, 18 % (n = 3) stating that they might, and none stating that they would not share future badges with these groups again.

Table 24.1 shows the responses to questions related to the perceived usefulness of the badges to different groups. Question 1 refers to the use of badges and a tool for reflection and personal record-keeping, while questions 2 and 3 refer to sharing badges with defined groups, potential employers and social contacts respectively.

Table 24.1 Reported usefulness of badges (n = 36)

		Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Mean	Standard deviation
1	Badges are useful for visualising my own development	3 (8 %)	1 (3 %)	13 (36 %)	15 (42 %)	4 (11 %)	3.44	1.03
2	Badges are useful for promoting myself to potential employers	3 (8 %)	3 (8 %)	6 (17 %)	18 (50 %)	6 (17 %)	3.58	1.13
3	Badges are useful for sharing my experiences with friends and family	3 (8 %)	5 (14 %)	12 (33 %)	12 (33 %)	4 (11 %)	3.25	1.11

Table 24.2 Reported motivational effects of badges (n = 36)

		Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Mean	Standard deviation
1	Badges **encouraged** me to **complete** activities	4 (11 %)	6 (17 %)	15 (42 %)	9 (25 %)	2 (6 %)	2.97	1.06
2	Badges **discouraged** me from **completing** activities	8 (22 %)	15 (42 %)	12 (33 %)	1 (3 %)	0 (0 %)	2.17	0.81
3	Badges **encouraged** me to do **extra** activities	4 (11 %)	6 (17 %)	15 (42 %)	9 (25 %)	2 (6 %)	2.97	1.06
4	Badges **discouraged** me from doing from **extra** activities	11 (31 %)	10 (28 %)	13 (36 %)	2 (6 %)	0 (0 %)	2.17	0.94

Table 24.2 shows responses to questions regarding the reported motivational effect of the badges on the respondents' activity. Questions 1 and 2 establish the level to which badges either motivated or demotivated respondents to complete the

core activities of the programme, while questions 3 and 4 do the same for any additional, optional activities.

Respondents were also asked about whether they would like to see badges used in other aspects of their university activities. When asked whether they would like to receive badges in the formal, taught modules of their degree programmes, 71 % (n = 25) of the 35 respondents stated that they would, while the remaining 29 % (n = 10) declared that they would not. There was stronger support for the use of badges in other co-curricular programmes and schemes, with 82 % (n = 28) of the 34 respondents being in favour versus 18 % (n = 6) being against. However, the use of badges in extra-curricular activities (those that take place outside any formal studies) was slightly more divisive, with only 62 % (n = 21) of the 34 respondents wanting to earn badges from external activities, and 38 % (n = 13) stating that they did not.

Open, qualitative questions allowed participants to expand upon their responses to the quantitative questions. While these were typically completed by a minority of those who responded to the survey overall, some broad themes did emerge from the responses. In particular, there was scepticism regarding the credibility of the specific badges earned through the programme, and digital badges as general indicators of achievement and experience appropriate for university students seeking graduate employment. One reason stated by respondents for this is due to the language used, particularly the association of badges with typical childhood activities such as learning to swim or the merit badges of the Scouting and Guiding movements. In particular, some of the respondents expressed the view that unless potential employers were aware of digital badges as a concept, and the significant learning they can represent, they would fail to understand the learning and development that these specific badges represent.

Several respondents explicitly contrasted the digital badges with an equivalent paper certificate, asserting that, as the certificate is a tangible artefact and is a widely recognised method of representing experience and learning, it would carry much more credibility than a digital badge. However, despite their scepticism around the value of digital badges, most of the respondents qualified these remarks with statements such as "… unless they are recognised by employers …", suggesting that the utility of digital badges is directly linked to their wider acceptance.

A number of respondents also stated that, prior to receiving the badges for this programme, they had no knowledge of digital badges being used to evidence learning and development and had been expecting to receive a more traditional paper certificate. As mentioned above, some respondents stated a strong preference for a paper certificate that they could take to job interviews as a physical artefact to use in support of their discussions, while others preferred the digital badge, stating that by being more easily shareable it was something that would help them stand out from other applicants and help them secure the interview in the first place.

The respondents in general reported little motivational effect from the badges, however individual responses varied from suggesting that badges would stimulate students to take part in activities and do additional work, through to stating that the badges were likely to have no motivational effect. None of the respondents stated that the badges were likely to have a demotivating effect.

3.1 Hypothesis H1: Students See Badges as a Way to Differentiate Themselves from Peers

The research confirmed this hypothesis, with the majority of those who claimed their badges sharing them with potential employers. The high-level of sharing through LinkedIn suggests that the participants view the badges as a way to enhance their professional profile generally, while the direct sharing with employers reported by half of the claimants indicates that badges offer a way for applicants to evidence their experience. In addition, being able to share badges with potential employers was viewed as their most valuable aspect (though the response was still only mildly positive).

3.2 Hypothesis H2: Badges Motivate Some Students to Complete Existing or Undertake Additional Work

The ability of this project to address this hypothesis was severely limited by the programme team's decision not to inform the participants about badges, how to claim them and what can subsequently be done with them until after the end of the programme. However, regardless of the possible reasons, the research did not confirm the second hypothesis as there was little effect on motivation reported by the respondents.

3.3 Hypothesis H3: Students Want Badges That Represent All Aspects of Their Studies, Including Formal and Semi-Formal Learning

The research confirmed this hypothesis as there was broad agreement among respondents that badges should be available in other aspects of their university careers. In particular, there was strong support for the use of badges in other co-curricular programmes and within taught modules.

4 Discussion

A severe limitation of the research, as noted in Sect. 3.2, is that the students were not informed about badges in general prior to the start of the programme, nor were they aware that they would be receiving a badge rather than a paper certificate until the badges were issued. While this was caused by circumstances beyond the control of the programme team, it led to some confusion among the recipients regarding badges and removed any potential for the research to investigate whether badges to provide a motivating effect. In spite of this, and the general lack of awareness of digital badges for evidencing learning, some of the comments from respondents suggest that the opportunity to earn badges would provide motivation to complete existing work or undertake additional tasks. However, the results shown in Table 24.2 suggest that, for these students, the motivating effect of badges is likely to be negligible—though it is even less likely to provide a de-motivating effect. The lack of prior awareness of badges is likely to be a factor in this result as is the fact that, as this was a voluntary scheme, the participants were already well motivated to complete the activities, and were primarily interested in badges as a way to represent their development to others. For both these reasons, therefore, this particular project is unlikely to be representative of the motivational effects of badges in situations where participation is mandatory.

The issue of the students not being provided with an introduction to badges is also likely to have affected their perception of the desirability and utility of badges, though it unlikely to have been the sole reason for the general ambivalence, and occasional hostility, towards badges as a concept. The preference for paper certificates suggests that badges, as a new development, currently face a credibility problem when compared to traditional recognition methods and it is clear from the results that the respondents view paper certificates as a way to gain an advantage over peers when seeking employment and further study. By not having an understanding of the purpose of digital badges, the recipients are less able to see any advantage in this use over paper certificates. In addition, the relatively neutral response from those with whom the badges were shared may also be a symptom of the lack of knowledge of the respondents meaning that they were unable to clearly articulate the significance of the earned badges.

In spite of these issues, with most respondents stating that the ability to share a digital badge as evidence when applying for a position would help them to secure the interview and would share future digital badges earned with the same groups. This point, combined with a significant majority of the respondents wishing to earn badges from their formal studies, suggests that the potential of badges for evidencing learning and development is intuitively understood by the cohort. However, the limitations of this research mean that, while it does not appear to be a significant issue among this group of motivated, career-focused students, further work needs to be carried out to ensure that badges used in the formal curriculum complement existing recognition mechanisms, such as grades, and are not detrimental to the students' motivation and development.

5 Recommendations

Despite a fairly neutral response from third parties with whom the badges were shared, most of the respondents would share badges with them again. This suggests that work to improve the understanding of badges by wider society would increase the value of badges to earners. In order to maximise this perceived value of badges, it is important that the concept of badges and their purpose be clearly explained. For potential earners, this explanation should take place prior to undertaking the first activity for which a badge will be awarded. This would ensure that any motivational influence of badges has an opportunity to be realised.

This research further confirmed that badges are seen by university students as another way of promoting their skills and experience to potential employers. Therefore it is recommended that, for this demographic, badges that highlight concrete, 'marketable' skills, experience and knowledge will be significantly more desirable, and therefore, more motivating, than the participation or more abstract badges that may be preferred by other demographics. However, the usefulness of badges as an employability tool also requires employers to value and recognise badges as evidence of learning and development, but there has, as yet, been little research into the perceptions of employers regarding badges. To this end, work to involve employers in the badge design process would assist in raising awareness and understanding of badges, further raising the desirability of badges among potential earners.

Another issue raised by respondents, and seen elsewhere in the literature, is that badges will only serve as a differentiator if there is a limited supply and when each badge represents meaningful, deep engagement and learning beyond the minimum that would be expected of all learners. Therefore, badges should be used to either encourage learners to do additional work or to reward those who have produced exceptional work, rather than simply representing attendance or low-level participation. As many badging platforms, particularly those designed to interoperate with the Open Badges specification, offer the ability to embed a link to evidence for meeting the earning criteria of a badge, it is recommended that this feature is used wherever practical to make explicit to third parties the amount and level of work required to earn the badge.

For some uses, the terminology related to digital badges can serve to undermine the effort required to earn a particular badge, and so damage its credibility with earners and third parties. One way to attempt to address this would be to use more formal and established terms when using digital badges, such as referring to them as digital certificates or credits. Likewise, until digital badges become more widely used, recognised and credible to both potential earners and those with whom they are likely to be shared, it is recommended that, where appropriate, equivalent paper certificates also be offered to earners. This will provide the earners with recognition of their achievements in a widely understood form, while still providing the option to share the digital badge at a later date. Alternatively, mechanisms to enable badges to be printed in a certificate-like format could be added to badging platforms to facilitate this use case, thereby enabling the sharing and verification features of the digital badges while also allowing a high-quality printed version to be used during job interviews.

The open nature of digital badges means that they can be created and issued by anyone, and for any purpose. This creates a further credibility problem for badges because it becomes extremely difficult to identify equivalence between similar badges issued by different organisations or individuals. Therefore, it is recommended that organisations implement some kind of quality control over the creation and issuing of badges to ensure that badges represent standardised levels of achievement. Education providers, such as universities, already have similar processes in place for academic programmes and a cut-down version of these could be used for 'signing off' badges. While this would do little to affect the credibility of badges in general, it would serve to enhance the credibility and trust in badges issued by organisations known to have robust quality processes for the design and issuing of badges.

6 Subsequent Work

As the overall response from the students was positive to the principle of using badges on the programme, they will continue to be offered to participants (though the option of a paper certificate will also be available). However, as a result of the feedback from the initial group, the programme team have introduced the participants to the concept of Open Badges at the beginning of the programme. While there has yet to be a formal evaluation, the programme team anecdotally report participants' reaction to the badges has improved and that they appear more motivated to engage in the training.

The research has also shown that there is interest in badges being used more widely and a follow-up investigation is taking place into how badges can be used with other groups, including staff, and incorporated into other schemes and programmes. In particular, research into how best to make use of badges as part of the formal curriculum is seen as a priority.

In order to address the perceived credibility issues of badges with employers, outreach activities, such as including major employers or professional bodies in the development of sets of badges, needs to be undertaken. Involving these organisations will also better align the badges with the employability skills and experience desired within particular industries, assisting employers in identifying graduate applicants with the skills they require and enabling students to tailor their skill sets for the industries in which they hope to work upon graduation more easily.

7 Conclusion

This research has confirmed the findings of previous research by showing that, for university students, badges are viewed as a way to market skills and experience to potential employers. Therefore, badges for this group would be best employed as a method of surfacing and highlighting learning that is not otherwise shown on a grade transcript, such as specific professional and transferable skills. However, it is also important to recognise that there is also significant potential for badges as a method of affirming personal development.

However, the findings also highlight the importance of ensuring that the purpose of the badges is clearly understood by potential earners as early in the process as possible. Without this understanding, there is no possibility of a motivating effect from the badges and the inability to subsequently explain the purpose of badges to others is likely to negatively affect the perceptions of those with whom the badges are shared.

Yet, in spite of the limitations of this project, particularly related to the timing of the badges being announced to participants, it is clear that there is interest in further use of badges in co-curricular activities among university students. More interestingly, there was also quite a strong interest in badges being available through the formal aspects of the students' courses. This suggests that students see value in having a more fine-grained method of representing, and sharing evidence of, their learning and development.

Badges have the potential to offer a reward and recognition mechanism that is efficient, motivating, shareable and meaningful. While there may still be some negative perceptions of badges within formal education environments, the fact that there is interest in expanded use of them across formal and informal learning contexts is encouraging. With careful consideration of how digital badges are utilised, and, crucially, how they are explained and promoted to relevant parties, they offer the possibility of a robust and flexible method for recognising achievement and experience.

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Chapter 25
Applied Gamification: Creating Reward Systems for Organizational Professional Development

Elizabeth C. Metzger, Laura Lubin, Rochelle T. Patten, and Janelle Whyte

Abstract The authors will explore using digital badges as a form of motivation within an organization. In order to do this the authors will examine three different psychology theories; humanistic psychological theory, behavioral psychological theory, and Gestalt psychological theory, showing the relationship between motivation and digital badges. The position of this paper is implementing digital badges, leaderboards, and points, in an organization's human resource development strategy will result in the influencing of behaviors an organization wants to target or change. The authors will discuss the overall application of digital badges, leaderboards, and points within the organizational context, specifically, internal gamification, where game mechanics are use to motivate staff to improve productivity, foster team work, or to create other positive changes in the organization.

Keywords Enterprise gamification • Psychological theory • Human resource development • Digital badges • Game mechanics

E.C. Metzger (✉)
Florida International University, 9723 N Grand Duke Cir, Tamarac, FL 33321, USA
e-mail: bizmetzger@gmail.com

L. Lubin
Florida International University, 3215 SW 52 Avenue #63, Pembroke Park, FL 32303, USA
e-mail: llubin@fiu.edu

R.T. Patten
Florida International University, 11000 Tarpon Bay Ct, Tamarac, FL 33321, USA
e-mail: rtpatten@fiu.edu

J. Whyte
Florida International University, 11222 SW 134th Lane, Miami, FL 33176, USA
e-mail: janelle.whyte@fiu.edu

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1 Introduction to Organizational Application of Gamification

Organizational learning tends to be given in disconnected chunks (Kapp, 2012). Policies, procedures, guidelines, and best practices are often taught and learned as memorized tasks by employees. These didactic rules intended to improve and help learners make deep connections with work experiences, often have the opposite effect (Kapp, 2012). Employees become unmotivated, bored, and disengaged with their tasks and training at work. Gamification is one strategy organizations can use to engage learners, aiding in knowledge retention, creating positive patterns in service, increasing user activity, and ultimately changing behaviors (Hamari, Koivisto, & Sarsa, 2014; Kapp, 2012).

Human resource departments are incorporating gamification strategies as a tool to recruit, develop, and evaluate talent. Donston-Miller (2012) indicates that by 2015, approximately 50 % of organizations that manage innovation processes will find ways to gamify those processes. Furthermore, gamification continues to grow as an industry, its value is currently estimated at around $100 million and it is projected to grow to $2.8 billion by 2016 (Erwin, 2012). With these projections, gamification seems to be a lingering trend, therefore, it is important to explore the possible impact gamification will have on AE/HRD and how it can improve organizational processes.

The purpose of this chapter is to explore gamification through the behavioral and humanistic psychological frameworks; focusing on the tools of internal, behavior-change gamification and how these tools can be applied to organizational professional development. More specifically this chapter will focus on the tools of internal and behavior-change gamification that involves using digital badges, leaderboards, and points within the organizational context.

1.1 Gamification

Gamification is defined as "using game-based mechanics, aesthetics, and game thinking to engage people, motivate action, promote learning, and solve problems." (Kapp, 2012, p. 12). It's important to note that gamification does not necessarily mean creating a full game, but incorporating gaming aspects to motivate and engage customers, students, and users (Deterding, 2012; Prince, 2013). Within gamification, the term interactive learning elements (ILE) is any combination of game mechanics applied to the learning environment (Kapp, 2012). Mechanics can include: achievements, avatars, badges, boss fights, collections, combat, content unlocking, gifting, leaderboards, levels, points, quests, social graphs, teams, or virtual goods (Werbach & Hunter, 2012).

Internal gamification, also called enterprise gamification, is when an ILE is necessary to motivate staff to improve productivity, promote teamwork, or to create other positive changes within the organization (Kapp, 2012). External gamification is used to engage existing or potential customers and is driven by desired purchasing behaviors or marketing objectives (Werbach & Hunter, 2012). Both internal and external gamification can use gaming elements to create a desired behavior change among the user population (Werbach & Hunter, 2012).

In order to apply gamification, companies should do a needs assessment to determine the extent of the skills gap that requires mastery or the development that must take place to improve organizational processes. The needs assessment will assist in determining the type of gamification an organization needs. In the needs assessment, organizations should identify the goals, objectives, and target audience. Once the decision on the audience and type of gamification has been made, organizations then use the goals and objectives to define how game mechanics will be applied to create intended change.

1.2 Digital Badges, Leaderboards, and Points

Drew Robb (2012) states that games can encourage employees to complete training tasks by rewarding employees with points, badges, or through leaderboards to display accomplishments. Badges are visual representations of achievements, or defined objectives, and often badges and achievements are used as synonymous terms. While badges are visible symbols of accomplishment, a digital badge is an electronic symbol that uses an icon to represent skills or achievement, confer status, and motivate deeper engagement (Bowen & Thomas, 2014; Kapp, Blair & Mesch, 2013).

Player, or in this case, learner, progression and can be tracked on organizational, departmental, or team leaderboards. Leaderboards are a public way of showing progression in a game situation and are used by the organization and individuals to track progress in comparison with peers (Werbach & Hunter, 2012). Leaderboards are used to keep score, determine a win condition, create a connection between progression and rewards, provide feedback, externally display of progress, and provide data for easy tracking. Points in an organizational setting can be earned through attendance streaks, completing training course competencies, or receiving organizational recognitions like employee of the month. Achievement of a certain amount of tasks enables the employees to earn points, badges, and level up in expertise (Werbach & Hunter, 2012).

When application of these aspects of gamification are combined with a strong needs assessment that supports the organization's goal for professional development, an organization is granted a unique opportunity to positively impact the working conditions of an organization. An organization owes it to themselves and the professional development of its human capital to fully investigate the benefits that gamification and its mechanics can bring to the way training and learning takes place within it's HR department.

2 Conceptual Framework

The position of this chapter is that the implementation of gamified aspects, particularly digital badges, leaderboards, and points, in an organization's human resource development will result in the influencing of behaviors an organization wants to target or change. Many HRD theories support gamification and game mechanics, and provide further support for an organization's choice to adopt gamification and game mechanics into their organizational policy.

2.1 Behavioral Theory and AE/HRD

As stated in *Psychological Foundations of HRD* the main focus of behavioral theory, also known as learning theory, is the observable change of behavior (Reio & Batista, 2014). In behavioral theory, knowledge and skills are thought to be an accumulation of each individual's personal experiences with their environments. The two most studied behavioral theories in the context of AE/HRD are operant conditioning and social learning (Reio & Batista, 2014). Operant conditioning focuses on reinforcing behavior based on rewards or punishment; while social learning focuses on how individuals acquire personality characteristics and social skills through observational learning or modeling (Reio & Batista, 2014).

Digital badges can be an extrinsic motivator by giving learners attainable and challenging goals (Jovanovic & Devedzic, 2014). "Learners who are rewarded from their effort or improvement instead of their performance tend to be more persistent on tasks and more orientated towards learning and improving" (Jovanovic & Devedzic, 2014, p. 58). Badges reward learners based on progress and/or improvement on a specific task (Jovanovic & Devedzic, 2014). When considering what is rewarding to the learner, the designer introduces something measurable and meaningful, giving the learner something to strive for, therefore increase their motivation to succeed (Werbach & Hunter, 2012). By using digital badges as a reward to completing tasks or participating in training, HRD professionals are actively and subconsciously changing and influencing employee behavior.

2.2 Humanistic Psychology and AE/HRD

"Humanistic psychology concerns itself with humans' intrinsic motivation to grow" (Reio & Batista, 2014, p. 7); stressing that we must pay attention to the individual's way of seeing the world to understand him or her best. Adult learning theory has been strongly influenced by the humanistic tradition. Knowles's Theory of Andragogy, the study of adult learners, postulates that adult learners are more likely to learn when they see the relevance of their learning to their everyday tasks

(Knowles, 1980). Although it seems as though points, badges, and achievements are introduced in gamification as objects of desire that have no real meaning; an engaged learner can find meaning in the objects which may come in the form of personal exploration and expression, contextual awareness, social connectivity, or that irrepressible tendency for games and play (Jensen, 2012).

What we know about humanistic psychology is, as a response to behaviorism and psychoanalysis, that behavior is a manifestation of what is in the mind of a human (Reio & Batista, 2014). If the goal of an organization is to change or influence a behavior to achieve a desired result, the minds of the target population must be trained to accept this desired behavior as positive. However, humans respond to incentive, despite it being the positive or desired thing to do. In humanistic theory, the idea of self-actualization is integral and thus, to actualize the end of a game and receive a reward for doing so may result in the desired end result of the organization (Reio & Batista, 2014).

Formal learning does not typically allow for failure, exploration, or trial and error. Most learners do not want to fail (Kapp, 2012; Werbach & Hunter, 2012). However, gaming elements actually encourage failure by allowing learners to explore their learning environment and granting multiple opportunities to perform a task until mastery (Kapp, 2012). As learned from Knowles (1980), adult learners want shared responsibility and self-direction in their learning. Exploring the environment allows users to shape their learning path, similar to Knowles's suggested learning contracts where "individuals make use of all of these resources in a systematic program of continuous self-development" (Knowles, 1980, p. 142). Additionally, badges serve as a visual symbol of the learner's personal knowledge journey, including what knowledge they find personally valuable, by showing off skills or competencies earned (Bowen & Thomas, 2014).

2.3 Gestalt Psychology and AE/HRD

Gestalt psychology, also known as gestaltism, is a school of thought that looks at the human mind and behavior as a whole (Reio & Batista, 2014). It is a cognitive theory centered on how individuals interpret the stimuli around them. The theory informs the AE/HRD field on how individuals move from one learning experience to another, as well as how well they interact with others depending on perception. Using Gestalt psychology, AE/HRD practitioners can better understand how perceptions and other elements play a role in group and team interactions (Reio & Batista, 2014).

Gestaltism has principles of perceptual organization that inform us how we form perceptions and therefore; how we make meaning based on our existing knowledge and way of making meaning from experience, unless we are able to witness our own process (Stevenson, Herb, 2014). These principles attempt to describe how people tend to organize visual elements into *groups* or *unified wholes* when certain principles are applied. The principles are similarity, continuation, closure, proximity, and figure and ground (Reio & Batista, 2014).

Using the Gestalt theory, AE/HRD must clarify the goals of individual contributors, work process owners, and/or organization leaders. By using the Gestalt principles learning is based on understanding the underlying principles of the problem. This type of learning comes from within the individual and is not imposed on by someone else. It is easily generalizable and is remembered for a long time (Clark, 2010).

Gamification ultimately provides a low-risk atmosphere for learners to experiment, practice, and receive constant feedback on their overall performance. Learners feel empowered to work through the learning environment resulting in increased engagement, motivation, and changed behaviors in the workplace (Robb, 2012).

3 Gamification in AE/HRD

Imagine if businesses used gamification to help streamline professional development goals so employees would know exactly how their skills are advancing and potentially which ones have actually grown instead of wondering, "How am really I doing?", "Is my work performance being ranked fairly?", and "How am I supposed to set goals if I have no idea what I am trying to achieve?" (Cook, 2013)

For an organization, digital badges give employers, managers, and employees visual representation of the user's progress, skills, abilities, and competencies and can represent different levels of mastery of knowledge over time (American Alliance of Museums, 2014; Bowen & Thomas, 2014). Badges can provide guidance of what can be done within a new system, an important part of employee onboarding or system orientations (Werbach & Hunter, 2012).

More than 70 % of the Global 2000 organizations have one internal, gamified system (Carey, 2012). Mozilla has collaborated with the National Human Resources Association and other organizations to help employers better understand how to use badges to motivate their employees (Grant, 2014). Many businesses and learning organizations are developing and credentialing digital badges including Purdue, Carnegie Mellon, the University of California, the Smithsonian, Intel and Disney-Pixar (Carey, 2012).

Delta Airlines use a travel game to promote competition and skills building within their organization. ILEs allow employees to navigate the globe, accessing activities and mini-games, to progress toward milestones and achievements, with the end goal of climbing to the top of the leaderboard. Delta found by using ILEs, user engagement and promoted internal competition has increased with more than 1400 players voluntarily playing the game in the first 2 weeks of launch. Within 2 month of its launch, Delta's employees voluntarily logged more than 16.2 million minutes of time into the ILE, which translates to more than 30 years of learning (Cook, 2013).

Like Delta, Deloitte Digital, a part of Deloitte Touche Tohmatsu Ltd, uses points, digital badges, and leaderboards as motivators for their employees. Employees are awarded points for actions such as logging in, leaving a comment, or visiting a page. Leaderboards show where individual employees rank and allow employees to identify company experts. When badges are awarded employees tend to display them on their Twitter or LinkedIn profiles (Robb, 2012).

A great example of seeing gamification translate to an increase of organizational productivity involves LiveOps Inc., a company which runs virtual call centers. It uses game based elements to help improve the performance of its 20,000 call agents who are independent contractors and are located all over the U.S. The company awards badges and points for tasks such as keeping calls brief and closing sales. They use leaderboards to allow users to compare their achievements to that of their peers. Since implementing the points, badges, and leaderboard, LiveOps, Inc. has seen agents reduce call time by 15 % and increase sales between 8 and 12 % (Silverman, 2011).

If the business world did not provide enough evidence of gamification increasing employee productivity and output, there certainly exists evidence that shows gamification contributes to adult education, overall. Take for example the Learning Technologies unit at the University of Washington (UW). UW replaced their seniority based promotion system with a skill-based system using digital badges as a catalyst. Badges are used to clarify the university's expectations of employee knowledge and paths of growth and are awarded for specific activities and for achieving mastery and expertise on a skill set. Staff members report increased motivation from both the clear objectives and self-directed nature of learning (Botra, Rerselman, & Ford, 2014).

Another adult education example is the ICT for Rural Education Development (ICT4RED) project initiated by the South African Department of Science and Technology (DST) in collaboration with the South African Department of Basic Education (DBE), the Eastern Cape Department of Education (ECDoE) and the South African Department of Rural Development and Land Reform (DRDLR). The organization use badges linked to technological and pedagogical goals, competencies, and formative assessment for teacher education. The design of the system guides the learners through a learning path providing feedback in the form of a badge as learners complete assessment items. Badges are displayed using Mozilla's Open Standards Backpack, so they can be displayed on the learner's social networking profiles. While ICT4RED hopes the system will encourage the learner to become lifelong learners and contribute to the digital world, the project has received already positive feedback from learners (Botra et al., 2014).

4 Suggestions and Challenges

Although there is tremendous potential in using digital badges in HRD, there are a number of challenges and best practices to consider. The examples listed all serve to build a case for the implementation of ILE's into current adult education and professional development trainings. The key for stakeholders interested in creating a gamified learning environment is conducting a strong needs assessment that highlights motivational gaps within the organization. Organizations should then probe further by assessing whether gamification of that gap will improve the current process or can if it can be improved through other means.

Adding in game mechanics to organizational learning takes purposeful planning (Botra et al., 2014). Often badge implementation needs a curriculum with learning pathways which can be more complex than just defining learning objectives (Grant, 2014). Although traditional teaching may not be the center of rewarding badges, facilitation and guiding of learning is still an important component to the learning process (Botra et al., 2014).

Once an organization establishes that gamification is the route to ensure engagement in training, it is important to frame the conversation with employees so the implementation has value for the employee. ILEs, digital badges, leaderboards, and points will serve to report to the employee how they are doing, feedback, and clear paths for learning and success. The user experience is extremely important when deciding how to implement badges in organizations. Badges should be designed to reward desired behaviors and organizations should be cautious of handing out meaningless awards or badges (Silverman, 2011). Badges should be relevant and meaningful to the learners, so it is advisable to study and get feedback on what the learner values (Grant, 2014). This should be part of the needs assessment an organization would implement long prior to incorporating ILE's into their training structure. Without the collaboration between the organization and employee on how gamification will be built into the organization's structure and continuous feedback from the employee, the results presented above may not represent the organization's experience with gamification.

It should be mentioned that badges can have negative impacts on motivation, including increased organizational competition which can create animosity among employees (Hamari et al., 2014; Silverman, 2011). Extrinsic rewards can be demotivating, so it's important to attach extrinsic rewards to specific outcomes and not to activities that can be motivated with intrinsic regulators (Werbach & Hunter, 2012). "The system will likely fail if you don't get this right" (Grant, 2014, p. 46). These considerations should be part of the game-design strategy an organization rolls out. Furthermore, organization should expect the implementation of game mechanics to be met with some level of resistance. It is important to highlight the benefits other businesses and educational institutions have with the implementation of gamification. It may not remove all possibility of negativity arising amongst a team, but it would be better to frame healthy competition before your gamification experience is rendered meaningless due to the attitudes of participants.

One of the benefits that can be highlighted to organizations who are considering gamification is standard credentialing. Due to the flexibility of badges, they can be used as part as of credentialing functions to demonstrate skills or competencies from an internal organization or from external trainings. Companies, such as the Mozilla Foundation, are building digital badge infrastructure to support badges, and provide a common baseline for badges issued by credentialing bodies. The infrastructure provides a platform to authenticate badge credentials, such as learning outcomes, issuer, and tasks completed, just by viewing the badge digital encoded data (Robb, 2012). However, badge creation and authentication tools are still in the infant stage and universal standards are not well established (Grant, 2014). This leads to wider challenges as badges become more popular and widely distributed, who and how will we regulate badges, will the establishment of some standardizing body on the legitimization of badges be necessary? Do we want that practice to be by industry? Or by organization? There are many unanswered questions to consider here. Using a digital medium also introduces concerns about identity management, learner privacy, and security (Grant, 2014).

Finally, mid-level management has to be a strong promoter of gamification in an organization. As part of the needs assessment performed, these key stakeholders should be eliminated as a major contributor of the motivational gap found within the organization prior to implementing any new training structure. As Kris Duggan, chief executive of game-maker Badgeville cautions: "adding gamification to the workplace drives performance but it doesn't make up for bad management. If you are a bad manager, gamification won't help you" (Silverman, 2011).

5 Conclusion

While there is evidence that suggests that gamification drives workplace performance and can contribute to generating more business through the improvement of services provided; it can turn out to be a costly, wasted effort if it is not framed precisely for what it aims to change. So that the foundational aspect of gamification, to motivate adult learners to improve, is not lost in the idea of fun and games; it is important that an assessment of the end result of the training is fully explored and that there is a strategy for transitioning into the assessment phase of the ILE.

Gamification is a tool, intended to keep employees motivated and engaged in the idea of training. In many of the examples provided, companies who were interested in being at the forefront of innovation found value added by incorporating game elements into their organizational processes and trainings. Companies values included that of collaboration and exploration, so a company's culture has to be open and flexible to accommodate ILEs in its structure.

The purpose of this chapter was to explore gamification through the behavioral and humanistic psychological frameworks; both of which offer support to the idea of gamification as part of a long term AE/HRD strategy. In reality, badges are not a new idea, and they do the same thing as credentials. However, the introduction of digital platforms for badges creates a more transparent system, making criteria, learning artifact, and assessments directly linked to the badge earner and issuing organization (Grant, 2014). Adding in game mechanics to a learning organization can foster a more engaging learning experience (Prince, 2013). However, critically speaking, gamification is not for every organization. Therefore, further study should be completed on the learner motivation and engagement with digital badges, particularly long term knowledge transfer.

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Chapter 26
Implementing Digital Badges in Australia: The Importance of Institutional Context

Deborah West and Alison Lockley

Abstract The use of digital badges in the tertiary sector, while gaining some momentum, is still in its infancy with institutions just beginning to think about how they might be used. While seen as one of the emerging technologies to watch in coming years, discussion on the use of badges can be connected to various concepts around the future of higher education and approaches to learning and teaching. Within this discussion issues are raised around credentialing, micro-credentialing (and the place of higher education in this), the relationship of this to competency based education, pedagogy and the role of emerging technologies.

The engagement of higher education more broadly in such discussions is a key stepping stone to the way in which digital badges can be conceived of, and potentially utilised. However, positioning of institutions around these issues and consideration of their own infrastructure gives rise to the various ways in which badges can be implemented in any given context. Working from the idea of institutional context, a range of use cases are highlighted and attention is drawn to both the challenges and opportunities these present.

The chapter considers the implementation of digital badges within the Australian context and presents a model which draws together contextual elements and more technical considerations for a badge system. Some of the key considerations include institutional directions such as strategic position, level of investment, policy and process issues, learning and teaching approaches as well as technical aspects.

Keywords Badges and • Implementation • Strategic positioning • Institutional context

D. West (✉) • A. Lockley
Charles Darwin University, Darwin, NT 0909, Australia
e-mail: deborah.west@cdu.edu.au; alison.lockley@cdu.edu.au

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1 Introduction

There is no doubt that the technological revolution is changing the society in which we live at every level. Information and communication systems are at the heart of this, offering much potential to re-shape our society including our education systems; through access to information, improved communication, internationalisation, and digital affordances amongst a range of other elements. As noted by the International Council on Distance Education (2013), 'The global landscape of post-secondary education is in a period of dramatic change. A significant driver for this has been a dramatic rise in the use of technology and the extension of the traditional campus to more learners' (p. 1). Linked to the extension of the campus, has been government agendas around the scope and purpose of higher education which broadly focus on increased participation and employability. Examination of these key drivers is essential in order to understand both the opportunities and challenges that arise in the implementation of badges. Additionally, how each of these is translated by any educational institution will determine what is feasible in the short and long term in relation to the use of badges.

2 Scope and Purpose of Higher Education

Universities, like any institution are context dependent in terms of the jurisdiction they operate in and their institutional positioning within that jurisdiction. In the broader jurisdictional context, government agendas, historical roots and cultural nuances all lay the foundation for the subsequent system in any country. Education systems are therefore shaped by these elements and connected to the legislative frameworks that establish and maintain the regulatory environment, funding models and broader policies within which universities operate. The potential for any change is bounded by such elements. Therefore it is essential to understand the context in which the sector operates in order to fully understand the challenges.

In Australia, such a position has been laid out in the paper, *Transforming Australia's Higher Education System* (DEEWR, 2009) which was developed as a result of the *Review of Australian Higher Education* (Bradley, Noonan, Nugent, & Scales, 2008); commonly referred to as the 'Bradley Report'. This review advocates for widening participation in higher education setting ambitious targets for 2020. Widening participation is linked to the idea of increasing the participation rates of those who have traditionally engaged in higher education at a much lower rate: Indigenous people, people with low socio-economic status and those from regional and remote areas (Bradley et al., 2008). Widening participation is inherently linked to an economic agenda as exemplified by the following statement in the opening pages of the report: 'The nation will need more well-qualified people if it is to anticipate and meet the demands of a rapidly moving global economy' (Bradley et al., 2008, p. xi). This agenda has tended to translate to a focus on professional qualifications, employability skills, pathways through education and seeking stronger connections to industry.

Such a shift, while increasing over a long period, should not be down-played as it goes to the heart and tension around education more broadly. As noted by Hashimshony and Haina (2006) the connection to government agendas and a greater focus on applied areas has continually increased since World War I (WWI). Despite this trend, universities have attempted to maintain their roots in a broader educational paradigm. Hashimshony and Haina (2006) draw attention to these roots stating that, 'The term 'university' derives from the Latin *universitas*, meaning corporation or guild, since, in the medieval world, scholars were considered to be a guild of specialists' (p. 6). For many, this connection to the traditional value base and purpose of universities remains, but is challenged by changing models and paradigms. However, society has indeed evolved and for various reasons, including economic drivers and widening participation agendas, students come to universities for a variety of reasons.

In Australia, students come to a university for three main reasons: to learn new things; to improve their employment prospects and to broaden their opportunities (Norton, Sonnemann, & McGannon, 2013). Each of these reasons can be broken down into some key areas, and most tend to align with employability. In summary Norton et al. (2013) identify the following elements (Fig. 26.1) under each heading:

The focus on employability from government and in large part industry and students, can be seen to align with competency based education. Yet industry is also seeking graduates with skill sets that could be seen to be derived from a mix of general education and employment-based degrees. Norton et al. (2013) report on a study from Graduate Careers Australia which show that for employers, 'the most important selection criteria are consistently interpersonal, oral and writing skills, drive and attitude, critical reasoning skills and work experience' (p. 32). There is then, a tension that exists between the more traditional view of the university as a place for education more broadly and government agendas (and subsequent funding approaches) around education for employability. While at the same time students and industry are seeking a mix of the two.

Balancing this tension between what is largely a competency-based approach and broader educational objectives is a key challenge and one which flows through to teaching approaches. Skidmore (2013) argues that what is needed is educating professors 'who are dedicated to educating a generation able and willing to transform our society for the better' (p. 2) rather than teaching professors who focus on specific disciplinary content. Many of the skills that he argues for are caught up in graduate attributes such as critical thinking, communication and social conscience. Both assisting in resolving these issues and fuelling the tension is the increasing predominance of technology in the sector.

As the definition of the university suggests, it was once the source of, and guardians of much knowledge in society. Yet the rise of information and communication technology means that information and knowledge is freely available to anyone in society who has access to the internet. This creates a fundamental shift in the

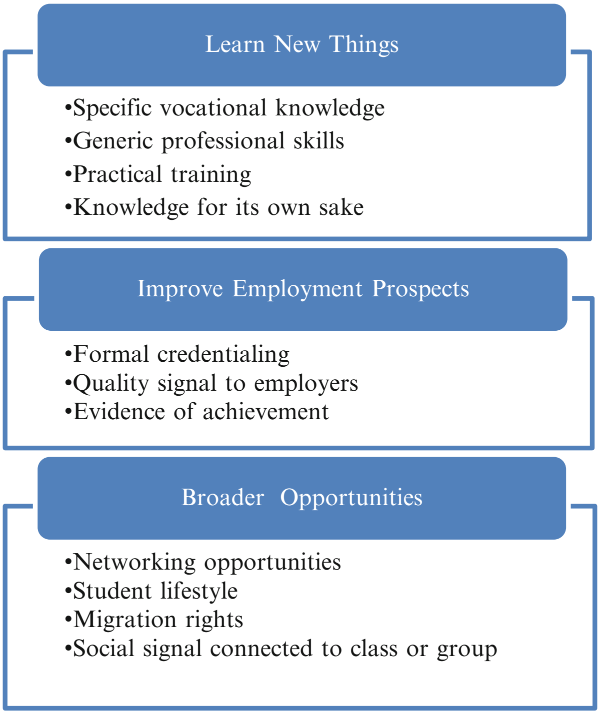

Fig. 26.1 Reasons students come to university in Australia (based on summary of Norton et al. 2013)

university itself, the status of the professors within in it, and the pedagogical approaches that are undertaken (West & Thompson, 2015). Additionally, the acceptance of the concept of lifelong and life-wide learning has become fairly commonplace, meaning that society places greater value on experience and knowledge gained from a variety of places, spaces and experiences. Yet, credentialing remains an important component for employment outcomes, government agendas, and is at the heart of the educational system.

As a variety of authors note, technological changes are seen as 'positive disruptions' to the education system. The concept of these being 'positive disruptions' is a value statement that speaks largely to the perceived need for changes in the education sector and the tensions that exist between more traditional views of education and the shift to a model more focused on employability and competency-based education. Arguably, the use of technology can provide opportunities for real transition in models and approaches, or it can be used to support existing paradigms. Therefore the application of such technology will lead to more substantive change, which is also due to the context and culture of any given institution.

Technological changes are underpinned by a range of key affordances such as digitalisation, open access, and the subsequent application of these to educational approaches and delivery. Such affordances can be capitalised on to varying extents, but largely focus at present on supporting and enhancing current models of practice. For example, this has translated into the increasing, and almost universal use of learning management systems in countries such as the United States of America (Dahlstrom, Brooks, & Bichsel, 2014) and Australia (West et al., 2015) and the rise of learning analytics, Massive Open Online Courses (MOOCs), and, indeed, badges. Each of these can be seen as tools to support and perhaps to encourage educational transformation.

Badges, as a tool, can assist in evidencing competencies which form the basis of employability skills, pathways, credentialing structures. Additionally, they provide the opportunity to incorporate skills from various spaces and places for credentialing. All of these are based on key underlying premises of badges being underpinned by the concepts of transportability, interoperability, transparency and security. However all of this will be context dependent in relation to national legislation, educational sector (and associated legislative requirements), institutional culture, and infrastructure.

As noted above, the idea of competency-based education, which uses badges as evidence of competency, is a key push by government. It is also the underpinning approach to vocational education in Australia, which is highly regulated. In higher education however, moving to competency-based education requires many institutions to transform their curriculum in significant ways in order to retain their funding base and adhere to legislative requirements. In the same way that Norton et al. (2013, p. 39) discuss online teaching, badges also will likely require, and perhaps drive changes to curriculum design:

> Online tools and platforms have significant potential to improve learning throughout mainstream on-campus education. The real game changer here is not purely online degrees replacing on campus courses. Rather, technology may drive a major re-design of teaching and learning across all modes of delivery.

Such changes are far-reaching and rely on the input and acceptance from various stakeholders including accrediting bodies, university accreditation systems, those who teach in universities, students and industry. By way of example, in order to use badges for micro-credentialing, each curriculum would need to be broken down into units smaller than a subject and assessment aligned to clear competencies. This is not unachievable, as has been demonstrated by Western Governors University who have radically changed to a degree structure predicated on the achievement of a set of competencies rather than a fixed timeframe (Norton et al., 2013). However, it also requires a major investment and commitment to a different system.

Additionally, to take advantage of many technological affordances, there needs to be a level of imposed structure across the institution or at least a discipline area. For example, assessment methods or delivery modes to demonstrate and capture competencies need to be in place. This is likely to challenge many in the sector who have had academic control of curriculum traditionally and who value academic autonomy.

Institutions have their own position within the educational market and this is connected to the broader community that they service, their historic roots, value base and focus. They also vary according to the technological infrastructure that they have in place. All of this translates to the nature of the programs that they offer, how they offer them, and the student cohort that they target and serve. This leads to great variations in uptake and application of technology such as the learning management system, simulated learning or learning analytics (Dahlstrom et al., 2014; Norton et al., 2013; West et al., 2015). Similar to these technologies, badges are quite likely to be used in different ways and implemented over different timeframes in different institutions. As such, it is useful to look at the variety of ways badges may be used, as these can highlight both the application as well as the nature of change required by an institution—ranging from fairly minimal to fundamental structure change.

3 Use Cases of Badges

By their very nature badges are granular, breaking work or learning outcomes into small units that can be grouped or stacked in a variety of ways. These granular units may comprise smaller learning or achievement atoms which have the potential to be utilised in more than one badge. For institutions, the wide variety of use cases presents both opportunities and challenges in adapting to the evolving online learning space. Institutions will need to consider which specific use cases would work for them, which align with their institutional context, and the extent of change required to incorporate a particular use case.

Badges can be particularly useful in building learning pathways, including those between vocational education and training (VET), universities and other training providers. They can be used internally within an institution, exported to build personal/professional portfolio, or kept in an external 'backpack' such as Mozilla. Of key importance is the purpose of each badge and the value it provides. There is a need to carefully consider the types of badges to be used, as failing to do so could create confusion and systematic tensions.

Drawing on a range of examples from the literature in addition to the authors' experiences, examples of the various types and applications for digital badges for an institution are outlined in Table 26.1: Use cases for digital badges. Within this table, badge use cases are grouped into four categories. The first category, *Within a unit/subject/course*, has both non-exportable and exportable badge opportunities. This includes non-exportable badges, used within the course by the lecturer to engage learners and indicate progress, as well as exportable badges issued by the school or faculty to indicate a level of skill.

Non-exportable badges, typically encouragement and progress indicators, are common in learning approaches that use game thinking and game mechanics to motivate and engage learners. While badges used in this context are not shared

Table 26.1 Use cases for digital badges

Type	Application	Why/benefits/value	Who controls them?	Who validates them?	Can they be exported?
Category 1: Within a unit/subject/course					
Concept/task	Game based learning/gamification	Encouragement	Lecturer	Lecturer/academic/disciplinary	No
	Curriculum element	Progress indicator			
	Formative assessment				
Modules of learning	Partial RPL	Links to pathways	University	School	Yes to portfolio
	Portfolio elements	Indication to industry of skill			
	Scaffold learning	Transportability			
Subject	RPL	Links to pathways	University	Faculty	Yes to Mozilla and portfolio
	Employment	Indication to industry of skill			
	Alternative assessment	Transportability			
Practical/work placements	Acknowledging practical experience	Indication to industry of skill	University	School/Faculty	Yes to Mozilla and portfolio
Category 2: Groupings across different units/subjects/courses					
Graduate attributes/21st century skills	Evidence and acknowledge competency across graduate attributes	Indication to industry of skill	University	School/Faculty	Yes to Mozilla and portfolio
		Employability skills			

(continued)

Table 26.1 (continued)

Type	Application	Why/benefits/value	Who controls them?	Who validates them?	Can they be exported?
VET skill set	Evidence and acknowledge competency for a specific skill set	Indication to industry of skill	University	VET School/Faculty	Yes to Mozilla and portfolio
		Marketing			
Category 3: Non-credit bearing courses/opportunities					
MOOCs	Engagement and progress indicator	Engagement	University	Whoever is running the MOOC	Yes to Mozilla and portfolio
	Credentialing of achievements	Progress indicator			
Community Projects	Engagement that the university wants to promote (e.g. community garden)	Acknowledge and recognise community engagement activities	University	Unit who look after community engagement	Yes to Mozilla and portfolio
	Recognition of projects			Marketing area	
Partnerships with other institutions or organisations	Enhance partnership arrangements through digital currency	Improved pathways	Partner group	Disciplinary	Yes to Mozilla and portfolio
	Recognition of projects	Evidence of key elements			
Category 4: Staff development					
Encouragement/reinforcement of culture	To encourage behaviour within and across the university (e.g. provision of PD, research activities)	Engagement	University	Line manager	Yes to portfolio
		Progress indicator			

Type	Application	Why/benefits/value	Who controls them?	Who validates them?	Can they be exported?
PD program elements	Evidence and acknowledge PD unit completion/skills	Acknowledgement	University	Area responsible for PD	Yes to portfolio
	Link to promotion portfolios	Progress indicator			
		Evidence for promotion			

beyond the classroom, they are still a valuable tool that plays an important part of a badge ecosystem.

Other badges within a course may be used to scaffold learning, show completed parts and subjects, as well as acknowledge practical placements. Used in these ways badges have potential for recognition of prior learning (RPL), including partial RPL of specific subjects. As such they may become exportable.

The second badge category, *Grouping across different units/subjects/courses*, groups competencies shared by more than one unit or course. These badges have huge potential as indicators of employability skills or specific skill sets, and are particularly important in acknowledging skills such as teamwork, leadership, communication and creativity, which are hidden in courses that were never intended to be transparent, yet are highly valued by employers. Badges can make these skills and experience visible to employers in ways that a traditional credential cannot (Grant, 2014). The flexibility and opportunity for employers to link directly with evidence from the issuer makes this a very exciting area for institutions to explore.

The third category, *Non-credit bearing courses/opportunities*, includes opportunities to credential non-credit bearing courses, such as Massive Open Online Courses (MOOCs), community projects, or partnerships outside the institution. Badging of these non-formal opportunities enable credentials that are meaningful and can be displayed alongside the accredited course achievements.

The last category is for *Staff development*. Badges here may be aligned to professional development activities or other activities in relation to work roles. The badges may relate to organisational knowledge and skills, such a projects or research, or to professional development events. These badges lend themselves to be included in ePortfolios, and have the potential to be used for promotion or review processes.

4 Potential Benefits of Badges

The bridge from achievement, in its various forms, to digital credential opens up learning pathways and opportunities to recognise lifelong and life-wide learning in both formal and informal contexts. This not only allows learners more autonomy and agency in demonstrating learning achievements (Grant, 2014) but also enables institutions a mechanism to acknowledge achievements, in a more visible, transparent and meaningful way.

On a micro level badges have the capacity to capture a learner's ability to use a piece of equipment, demonstrate knowledge of a particular topic, or capture specific skills or experience (Foster, 2013). Hence badges have a very real advantage in scaffolding learning and could be used to recognise core skills for multiple courses, reducing duplication and enhancing efficiency with instruction.

Badges can be used as a means to reinforce the multiple pathways to achieve a learning goal. Badges are able to capture evidence of the learning pathway and related experience and interests, facilitating student progress and instructional management linking with rich data and digital artefacts (Foster, 2013). These visible indicators of achievements also provide maps for other educators and allow institutions to better cater for flexible learning.

Perhaps one of the greatest benefits of digital badges is the verifiable way that a badge can connect with the issuer, and specific information relating to the particular badge. Badges provide opportunities to display skills and achievements, in ways not possible before. Unlike traditional transcripts, badges can link directly to digital artefacts, such as photos, videos, assessments or work samples. Badges can represent the learning journey, with achievements linked to details on the full story. The digital nature of badges means they can be stored and shared through various ePortfolios, social media sites, or displayed is purpose-built frameworks such as Mozilla Backpack. Mozilla's Open Badges Infrastructure (OBI) provides a framework to document and distribute badges; this framework includes free software and technical standards. Through the OBI any institution can create, issue and verify digital badges, and badge earners can manage and display their badges.

Shared standards can enable other systems (such as educational institutions) to recognise and share digital badges, allowing the credentials to travel outside the platform they were issued (Grant, 2014). This opens opportunities for recognition and partnerships, offering greater flexibility and mobility to students, and prospects for new business models for institutions.

The use digital badges also opens up other possibilities that foster connections and flexibility, such as building community and social capital (Bixler & Layng, 2013). Badge earners can seek connections with peers or others with similar interests, by searching for specific badge types. Badges could also be used to recognise experts in a field, and people with specific skills, knowledge or experience. For example users of Stack Overflow, a question and answer site for programmers, can achieve badges for being helpful. These badges appear on their profile page and posts, and enable people to connect with others who share specific programming skills and knowledge.

On a macro level, digital badges can acknowledge and recognise community engagement, partnerships and student outcomes that link with strategic directions and key performance indicators of issuing institutions. Badges allow monitoring and reporting of activities and events, and provide a means to acknowledge stakeholders in a variety of ways. Since each badge is information-rich, important data about the nature and criteria of the achievements can be detailed, providing valuable information to both the issuer and the recipient/s. For example, a community project with an education institution and an external organisation could be recognised through a badge, which could be displayed on websites and linked to project outcomes, photos and reports, enabling acknowledgement and profile raising.

5 Badge System Considerations

Institutions contemplating the move to digital badges will need a strong badge system. The badge system requires an effective framework that is informed by best practice and research-led to meet client needs. Like any system, a badge system will need to be supported by policy, guidelines, and processes and link to existing institutional practices. Badges are not assessment instruments, but rather indicators of achievement that must link to assessment frameworks. These achievements translate to evidence of assessment, as verified by the issuer. Hence they are reliant on valid and appropriate assessment. Value and trust underscores a badge system (Finkelstein, Knight, & Manning, 2013) and the issuer must consider what would underpin the issuing of any given badge, as well as have appropriate options to authenticate and "bake a badge" in order to prevent fake badges.

There is much to consider in a badge system as shown in Fig. 26.2: Badge system considerations. Prior to establishing a badge system the institution will need to contemplate the existing capabilities of their learning management system, and whether a badge system can be integrated or layered on top of the existing platform or whether a new platform is needed (Grant, 2014). A badge system will need to be flexible to cater for a range of different use-cases and badge types (such as those in Table 26.1: Use cases for digital badges). Flexibility is also needed to allow badge holders to choose where and how badges will be displayed and who is able to see them (private or public access).

Any use of badges relies on having key infrastructure in place and the more 'advanced' use of badges requires greater investment in elements such as technical infrastructure, curriculum re-design, policy, processes, training and stakeholder buy-in. Therefore institutional responses to opportunities and decisions on whether to take up any technology, including badges, will be driven by institutional values, culture, student market and strategic directions.

There is also much to consider in relation to system responsibilities. Who will provide the technical support? Who will map the content and pathways for badges?

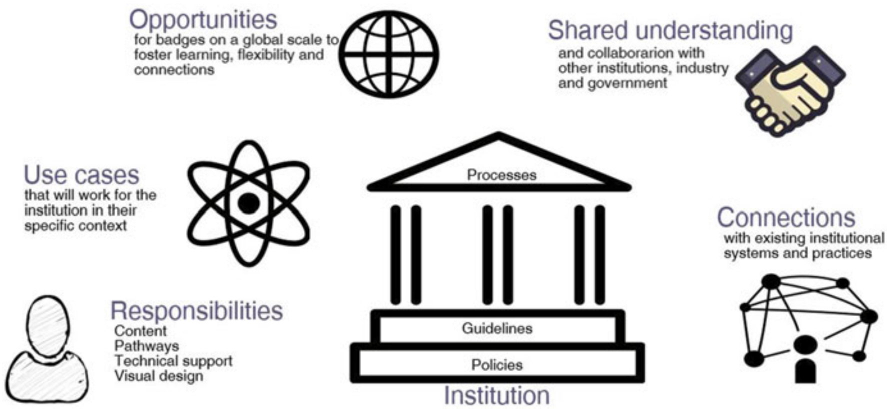

Fig. 26.2 Badge system considerations

Who will provide the visual design? Further, for a badge system to truly work, there needs to be a shared understanding and collaboration amongst institutions, industry and government at a local and national level. If badges are to mean something they will have to be recognised and valued, for learning and for employment. Finding common ground for badges through partnerships with other institutions or industry provides real opportunities for new pathways of learning and new ways of recognising achievements.

For badge systems to be successful there must be a clear understanding by all stakeholders on how badges work, and the role each takes within the system. As seen in Fig. 26.3: How badges work, institutions will need to be able to communicate what badges are on offer and the criteria needed to achieve them. Evidence is collected for a badge, which may take variety of forms. This will be presented for verification and

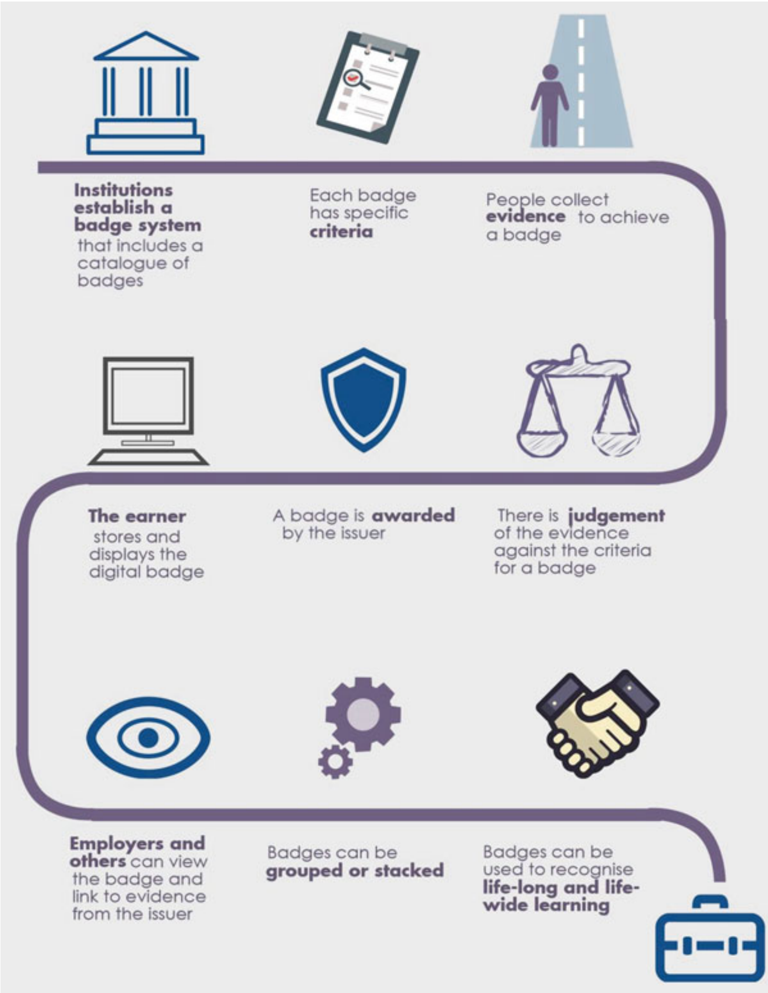

Fig. 26.3 How badges work

a judgement on achievement by the issuing institution. Once achieved, badges can be stored and displayed in a variety of ways by the badge earner, and even grouped or stacked with other badges to gain further achievements.

6 Badge Design Considerations

As a digital badge serves to visually represent an achievement, visual design can be very important. In creating individual badges, an institution should establish a design strategy to guide consistent practice. While consensus has emerged that badge design should be as legible as possible (Enkerli, 2014), the design approach is quite contentious. A common design approach is to blend images and words, and use colour coding. Other approaches use no words or branding, and simply have designs to capture the attention and relate to content of the badge itself. Different use cases may lend themselves to different designs, with credit-bearing badges taking a more formal design approach.

Whatever the design approach, attention needs to be given to the visual appeal of a badge and the way each displays on different screen sizes, including mobile devices where finer details can be lost (Grant, 2014). Institutions need to consider their branding guidelines and the specific identity that different badge use cases may require. For example, badges used for encouragement and engagement within courses, or for recognition of non-accredited opportunities, may have a totally different design than those used for accredited or more high-profile purposes. Irrespective of the type badge, all badges need to have specific criteria which defines and separates them from other badges. In the same manner as the SMART system guides development of goals and objectives (Doran, 1981) the BADGE model (Fig. 26.4: Badge information criteria) can be used to guide the collection and collation of information required for a digital badge. This information is needed not only to establish, link and define the badge, but is also critical for the assessment and visual design that relates to each badge.

Each badge must be specific, explaining what the badge represents, and its value proposition. There has to be acknowledgment about how the badge was achieved and the measures used. Links to other badges and/or standards need to be transparent, along with descriptions of the achievement. Many badges will be able to directly link with artefacts, which offers a great advantage over traditional credentials.

7 Conclusion

Digital badges present many opportunities in the higher education sector, including supporting a shift to competency based learning, evidencing different ways of credentialing, addressing and evidencing government priorities, and providing greater opportunities to enable student progression and pathways. However, there

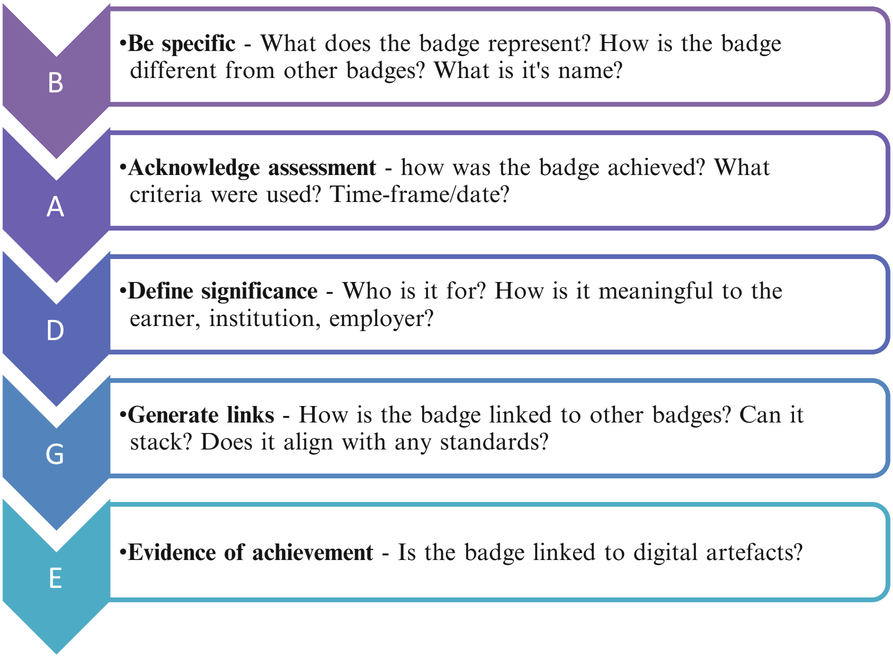

Fig. 26.4 Badge information criteria

are many challenges along the way, including national legislative and funding framework, technical infrastructure, institutional culture, and resources.

Each institution will also have its own opportunities and challenges based on their institutional culture, values, student cohorts, programs offered, technological infrastructure, and investment expectations of key stakeholders. The decision to use badges in particular ways and their successful implementation will rely on consideration of such factors and strategic positioning of the relative benefits that badges can offer. The impact that badges, amongst other disruptive technologies, have on the foundation of the 'university' remains to be seen. However, universities have managed over hundreds of years to maintain their core educational focus while evolving and, in many ways, leading societal changes; they will likely continue on that path, thus engaging with and incorporating many 'disruptive technologies' along the way, including badges.

While badges have the potential to fundamentally change how we represent learning achievements and pathways, badges are not the panacea for poor pedagogy and outdated content. A badge system will not motivate a disengaged learner or compensate for poorly designed curriculum and will not replace other factors critical to the success of lifelong learning such as teachers, mentors, or peers (Grant, 2014). Badges represent a transparent and meaningful way of credentialing achievements, which rely on the interaction with other learning systems and institutional frameworks and infrastructure.

There is no doubt there is risk involved in the implementation of a digital badges system. If done well, there is huge potential for educational institutions to reap considerable benefits and enable flexible education catering to the needs of students and industry, in a way that is meaningful and valuable in today's educational ecosystem.

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Chapter 27
Development and Implementation of Digital Badges for Learning Science, Technologly, Engineering and Math (STEM) Practices in Secondary Contexts: A Pedagogical Approach with Empirical Evidence

Angela Elkordy

Abstract Designed purposefully, digital badge learning trajectories and criteria can be flexible tools for scaffolding, measuring and communicating the acquisition of knowledge, skills or competencies. This flexibility permits a myriad of possibilities—and pitfalls—for teaching, learning and assessment in K-12 and professional learning contexts. One of the most often discussed attributes of digital badges, is the ability of badges to "motivate" learners. However, the research base to support this claim is in its infancy; there is little empirical evidence. A content-agnostic, skills-based digital badge intervention was designed to demonstrate mastery learning in select, age-appropriate, Next Generation Science Standards (NGSS). The design was informed by theories of learning (Vygotsky. Thought and language. Cambridge, MA: M.I.T. Press, 1967; Bandura and McClelland. Social learning theory, 1977, http://sjsu.edu/counselored/docs/EdCo.248.Social_Learning_Theory.pdf; Wenger Communities of practice: Learning, meaning, and identity. Cambridge; New York, NY: Cambridge University Press, 2000) and the Connected, Learning Model, (Ito et al. Connected learning: An agenda for research and design. Irvine, CA: Digital Media and Learning Research Hub, 2013), as well as theories of learner engagement and motivation (Fredericks et al. J Educ Res 74(1), 59–109, 2004; Malone and Lepper. Apt Learn Instruct 3(1987), 223–253, 1987). The impact of socio-economic challenges or linguistically and culturally diverse populations is considered. The pedagogical approach was informed by best practices in teaching and assessment. Substantial supporting materials were also developed including training materials and implementation documentation. Among the findings were statistically significant increases in measures of *motivation* including self-efficacy, self-regulation and perceived competence. In addition, both students and teachers found the badges were motivating for learning, with teachers reporting enhanced learning products

A. Elkordy (✉)
National College of Education, National Louis University,
5202 Old Orchard Road, Suite 300, Skokie 60077 IL, USA
e-mail: aelkordy@nl.edu

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and student engagement. Results from factorial analysis suggest that digital badges present a hybrid motivational construct which consists of aspects of both performance and learning goal orientations. Suggestions for future research include additional study on the design principles for standards-based digital badges and research to understand the theoretical basis and best practices in using digital badges for motivating students.

Keywords Informal and formal learning contexts • NGSS • Motivation • Assessment • Student engagement • Scientific practices

1 Introduction

1.1 Introduction: Science, Technology, Engineering and Math (STEM) Skills Deficits

Transformed by advances in recent decades in computer and Internet communications technologies (ICT), our interconnected and networked world is dependent upon knowledge in science, technology, engineering, and math (STEM) disciplines. Developments in ICT technologies have also precipitated significant change in the processes and systems of non-STEM workplaces. There is an increasing, yet unmet, demand for workers with expertise in STEM content knowledge and competencies, particularly those associated with creativity, invention, and complex problem-solving (Gmür & Schwab, 2014; United States Department of Commerce, 2012a; U.S. Department of Commerce, 2012b).

There is global concern about the deficit of skilled STEM workers, a perplexing problem because knowledge and activities in STEM fields are directly linked to nations' capacities to compete (Bosworth, Lyonette, Wilson, Bayliss, & Fathers, 2013). Numerous studies over the past decade have underscored the essential nature of STEM skills for U.S. competitiveness and innovation, especially in the context of a global marketplace (Congressional Commission on the Advancement of Women and Minorities in Science & Engineering & Technology Development, 2000; U.S. Department of Commerce, 2012b).

The shortfall of skilled STEM workers is a major concern for the United States. It is the subject of national debate and study to determine the causes of the deficit with the aim to understand, and ultimately to create, a solution. According to national studies, the problem begins in the preparation of potential workers, in the so-called STEM *pipeline*, and includes issues of quality, access as well as student motivation and engagement:

> Despite the clear demand for STEM talent by domestic employers, the U.S. is failing to produce an ample supply of workers to meet the growing needs of both STEM and non-STEM employers. The existing STEM pipeline leaves too many students without access to quality STEM education, and without the interest and ability to obtain a degree or work in STEM. (U.S. Congress Joint Economic Committee, 2012a, p. 3)

The reasons for the deficits in STEM workers are complex and varied, which impedes a quick resolution. Particularly concerning, is the lack of diversity of workers in STEM fields of practice. Substantial and persistent achievement gaps in STEM and other critical areas for some underserved youth perpetuate this problem. The achievement gaps of Black and Hispanic students, in particular, must be ameliorated for increased minority participation in the STEM workforce (Gonzalez & Kuenzi, 2012; Ito et al., 2013; U.S. Congress Joint Economic Committee, 2012a).

A concern with far-reaching repercussions, especially for women and minorities, is the lack of student engagement, associated with greater academic achievement, in STEM activities. Underdeveloped student characteristics such as persistence-at-task, motivation and the effective use of metacognition (Fredericks, Blumenfeld, & Paris, 2004) as well as access to high quality science education, compound the problem. These concerns, along with the lack of successful role models in STEM careers, has impaired the critical formation of *STEM identities* for many learners. Without this essential component, that is, students' beliefs and self-perceptions of their own capacities for success in STEM areas, students' pursuit of education in STEM disciplines, and ultimately, the pursuit of STEM careers is adversely impacted. For young children, discovery learning is so important; children learn through exploring and testing ideas. Using digital badges as a pedagogy, educators could foster similar learning strategies in youth by fostering the ideas of learning through trial and error, persistence and productive failure.

1.2 Why Digital Badges?

Learning is an any-time, anywhere activity, occurring spontaneously in the context of a digitally-mediated and facilitated world (Fontichiaro & Elkordy, 2013a). *Digital badges* have been proposed as a system to recognize and communicate achievement in a variety of learning contexts, particularly informal frameworks. As such, digital badges have the capacity to bridge formal and informal learning environments and to make learning in each context *visible*.

The development of the concept of digital badges is an outcome of a convergence of forces: a changing global work force, an evolving educational landscape and the rise of online learning resources, particularly *open* resources and *open* education. One of the most compelling reasons the idea of digital badging and micro-credentialing is gaining traction is the need for new knowledge and skill sets to be somehow quantified and communicated. As the workplace evolves, new methods to assess, measure and competencies and transferable skills have been necessitated by the need for workers to participate in on-going professional development and to periodically *retool* as skill sets become obsolete. This kind of job-related learning, often occurring in informal contexts, has neither been measured nor communicated systematically. However, the proliferation of the culture and practices of life-long, life-wide learning in both formal and informal contexts compels a solution to acknowledging, scaffolding and communicating this knowledge. It may be possible for digital badges, functioning as micro-credentials, to bridge learning contexts, recognizing and communicating competencies acquired in both formal and informal environments.

Digital badges are aligned with the idea of competencies or skills-based learning and the measurement of informal learning which can be particularly effective for STEM content knowledge as well as practices. The increase of informal, out of school learning experiences for pre-college students is recommended, particularly for women and minority students who remain underrepresented in STEM disciplines (Congressional Commission on the Advancement of Women and Minorities in Science & Engineering & Technology Development, 2000; Democratic Staff of the House Committee on Science, Space, and Technology, n.d.; National Science Foundation, n.d.). Furthermore, digital badges support recent recommendations to support *evidence-based approaches* in STEM education (Federal Coordination in STEM Education Task Force, Committee on STEM Education, & National Science and Technology Council, 2012).

Gibson, Ostashewski, Flintoff, Grant, and Knight (2013) called for a research agenda on digital badges examining "several new affordances for education that need additional research…and the impact of digital badges in education on the psychology of learning" (p. 7). They voiced a concern articulated by badge skeptics, specifically about the possibility of digital badges to replace "intrinsic motivation to learn." They pose the question "…would that be a bad thing if they did?" (Gibson et al., 2013, p. 7). For educators working with youth learners of secondary school age, these affordances can be leveraged to open the possibility of connecting student learning in informal and formal contexts and to personalize learning through differentiation of learning processes and products.

In addition to acknowledging self-directed and self-motivated informal student learning, when purposefully designed and implemented, digital badges can be powerful pedagogical tools to promote student engagement, motivation in formal learning contexts. By making learning visible through criteria which clearly articulate learning targets, competencies can be effectively scaffolded and become clear to the learner. These attributes of instructional design reflect best practices in assessment (Stiggins & Chappuis, 2011).

Digital badges can be effective in competency-based models of education. They are flexible tools which can be used to promote higher order thinking skills and facilitate the assessment of discrete skill sets or competencies. The evidence-based model of digital badges is particularly suitable for promoting experiential learning and performance assessment, critical to STEM education and outcomes. When learning targets are clear and the products to demonstrate understanding or competency in objectives are flexible, students are empowered to take ownership of their own learning and critical components of metacognition, such as self-regulation, are fostered. Digital badges may be particularly effective with middle and high school students because they intuitively understand the social capital and idea of *currency* of digital badges.

Could digital badges effectively scaffold learning in STEM content? Would students find them motivating? How can digital badge learning trajectories be implemented in a formal learning context to incorporate out of school learning? This research study explored the careful application of rigorously designed digital badge learning trajectories for STEM learning in an underserved population to explore these questions.

2 Literature Review: STEM Practices

This abridged literature review section focuses upon: 1) STEM learning and assessment in a digital age 2) digital badge for learning in formal and informal contexts, 3) motivation and learning, and 4) digital badges and motivation.

2.1 STEM Learning and Assessment in a Digital Age

The idea that learning or meaning is constructed through and within social contexts was initially proposed by Vygotsky. He theorized that learning occurs when individuals internalize concepts mediated through spoken language. Vygotsky (1967) postulated that individuals create meaning through the processes of social discourse by internalizing language as individual thought. Since then, the social constructivist learning theory has been modified and adapted by educational theorists including Jerome Bruner (2006), Brown and Adler (2008), and Etienne Wenger (2000). Learning is considered as an individual, cognitively-based activity which is socially-mediated; meaning is made through socio-cultural contexts and interactions with others.

We increasingly live in an age of convergent media, where production, sharing, and participation are the norm and expectation, at least for our youth. There is *fluid* group formation and cognitive, social and linguistic complexity, all embedded in popular culture (Gee, 2010, p. 14). Various theorists have written about the role of language, learning and cognition. Within these socio-cultural contexts, when learning occurs, it is contextual. In terms of the theory of situated cognition, learning is embodied, and knowledge and intelligence are contextual and distributed across tools, technologies and groups (Gee, 2010). Situated cognition emphasizes practices of collaboration, using tools and technologies. The concept of situated cognition is consistent with Social Constructivist theories of learning, which postulate that meaning is constructed by individuals within a larger social context, and that meaning is interpreted using memory and existing schema. In response to socio-cultural changes, the Connected Learning Model (CLM) has been proposed by researcher Mimo Ito and others, in order to describe how learning occurs in these connected learning environments (Ito et al., 2013). The CLM builds upon earlier models of social learning in its emphasis upon *participation*, *shared purpose* and *peer culture* while adding aspects of digitally mediated culture such as *openly networked* and *interest*.

In practice, practitioners and learning theorists have integrated the principles of social-constructivist learning theory through strategies which include class discussions, collaborative learning, or reciprocal teaching (Brown, Collins, & Duguid, 1989). The result is the acquisition of new learning, either directly or vicariously (Bandura & McClelland, 1977). Etienne Wenger (2000) called groups of learners collaborating and working together *Communities of Practice* and described "Learning [as] the engine of practice, and practice is the history of that learning" (p. 96). This concept of learning within a community of practice, which leverages experiential learning as well as the premise that learners move along a trajectory from novices to experts, is highly compatible with the shifting view of STEM pedagogy. The notion that learners must approach STEM content as *practitioners*, first as novices, to authentically *experience* science, is the foundation of the NGSS performance standards and cross-cutting concepts. The learner-as-practitioner model is a distinct shift from the inquiry-based learning model which has been pervasive in formal educational contexts. In informal learning contexts, the learner-as-doer and maker-of-trials as long been an effective learning model which fosters curiosity and normalizes failure as an integral aspect of design and problem solving.

2.2 Digital Badges for Learning in Formal and Informal Contexts

Core concepts of the new digital badge movement are ideas of equity and transparency as well as recognition learning in diverse contexts. In many ways, these concept mirror, and are inspired by, the entrepreneurial and open spirit of the Internet itself. Much of this learning occurs in informal contexts and is currently neither recognized nor communicated effectively.

A report published by the *European Centre for the Development of Vocational Training* (2001), which reviewed various European initiatives to quantify and communicate the outcomes of informal learning, is representative of the growing, worldwide interest in the premise. In *Making Learning Visible*: *Identification*, *Assessment and Recognition of Non-Formal Learning in Europe* the author discuss the importance of this issue (Bjornavald, 2001). It is necessary to make learning, which takes place outside formal education and training institutions, more *visible*. Non-formal learning is far more difficult to detect, evaluate and communicate. This *invisibility*, is increasingly perceived as a problem, impacting competence development at all levels, from the individual to society as a whole (Bjornavald, 2001, p. 11). Furthermore, the author urges that "…competencies have to be made visible if they are to be fully integrated into a broader strategy for knowledge reproduction and renewal" (Bjornavald, 2001, p. 21).

The use of a system to assess and promote learning in STEM knowledge and practices has potential for a variety of reasons. Despite their importance, many of these skills remain untaught, or they go unmeasured through the current, often *standardized*, processes of assessment in formal educational environments. Furthermore, the persistent lack of alignment between the goals and outcomes of educational systems and the requirements of the workplace has contributed to the paucity of skills in some areas, and overabundance in others. A new, more effective way of assessing learning is essential for twenty-first century learners.

Making competencies visible: **Boundary objects**. In his joint report with the OECD, Werquin (2010) asserted that "Recognition generates four different types of benefits" (Werquin & Organisation for Economic Co-operation and Development, p. 8) in recognizing skills learned in informal environments: shortened time for acquisition of qualifications; more effective deployment of human capital; and increased coordination between employment and individual employee talents. Life-long learning increases educational and social benefits for the learner, fostering equity and improved access to education and employment, particularly for disadvantaged groups. Life-long learning provides a "…psychological boost to individuals by making them aware of their capabilities" (Werquin & Organisation for Economic Co-operation & Development, 2010, p. 9).

To meet the demand for new knowledge, new learning and assessment paradigms must be developed in socio-cultural contexts. The use of digital badges for scaffolding, assessing, and communicating learning, within connected contexts, is one possible solution. As such, digital badges can function as *boundary objects*, i.e. objects which exist in different contexts and have context-specific properties, but share enough of a framework to be useful as a construct which traverses these limits or boundaries (Rughinis, 2013; Star & Griesemer, 1989). Wenger (2000) description of a *boundary object*, a way of translating the practices and social capital of one community to other, dissimilar communities, suggests digital badges are almost ideal for this purpose (as cited in Halavais, 2012, p. 367).

2.3 Motivation

"Motivation is a theoretical construct used to explain the initiation, direction, intensity, persistence and quality of a behavior, especially goal-directed behavior" (Brophy, 2010, p. 3). In K-12 environments the behavioral view has proliferated; it is visible in attempts to modify behaviors through reward systems, grading, strategies to gain student compliance, and negative consequences for breaking rules or failing to comply with targeted behaviors.

Extrinsic motivation can be a major concern for educators. Misapplied, extrinsic motivators can act to demotivate learners and create false expectations of reward which may impair intrinsic motivation (Hattie & Timperly, 2007). Motivation is a factor associated with self-concept and academic achievement. It is an important factor for minority students including Arab Americans and African Americans in self-esteem and positive identity formation (Kovach & Hillman, 2002). Malone and Lepper (1987) have proposed a taxonomy of intrinsic motivations, which they suggest "make learning fun" (p. 223). The concepts, including curiosity, control, and challenge, are often incorporated into game-based learning, where they function powerfully to engage learners to the point of *flow*, an optimal state of intrinsic motivation when participants are motivated and engaged (Csíkszentmihályi, 1990).

2.4 Badges and Motivation

The idea of using badges in education remains controversial, with advocates and detractors having strong opinions on either side; some commentators are concerned that badges are an extrinsically motivating behaviorist strategy to reward learning, which will lead to badge acquisition as the goal, versus the learning goals themselves. Dr. David Goldberg's response below acknowledges that this may superficially and sporadically transpire, but that in the process of learning and badge acquisition, intrinsic motivations do occur:

> In the Kantian vein, then, we could conclude that badges without effective learning would be empty, even useless; while learning without a badging system that embeds an assessment capacity capable of motivating further learning—both more and deeper—would be missing an opportunity to draw into the lure of learning some, if not many, of those we otherwise are in peril of losing. And that's a good, perhaps even in itself. (Goldberg, 2012)

Regarding the idea of motivation itself, Professor Goldberg, cofounder of the HASTAC organization, and co-sponsor of *Digital Media and Learning Competition*, continued:

> …the deeper point about badges is that where they work, they work always within contexts that socially support them and where their users are invested in their significance. They do not work for everyone, as motivations or modes of recognition (2012).

Digital media expert and cultural commentator, Henry Jenkins expressed concern that youth learning informally may be *alienated* by the formalistic processes of badge acquisition, before they have a chance to exert ownership over the knowledge they are acquiring. Furthermore, he noted that this issue would grow when the system of digital badges moves into a global phenomenon, when cultural contexts will mediate the meaning and value of badges (Jenkins, 2012).

One of the major concerns and advantages of using digital badges to recognize learning is the pivotal issue of motivation which is closely associated with engagement and academic achievement (Steinmayer & Spinath, 2009). Skeptics are concerned that badges are a purely extrinsic reward system, which will result in learners working hard to collect badges as rewards (equivalent to good grades or gold stars), rather than learning.

Digital badges, however, are an educational intervention adapted and derived from the world of online gaming where they are a widely recognized symbol of achievement. According to Ostashewski and Reid (2015), "Emerging from the intersection of games cultural, visuals on the Internet, and the traditional and historical uses of badges and medals, the digital badge is an online visual representation of an accomplishment, skill or award" (p. 187). Educators have been interested in understanding how digital game elements engage and motivate participants so effectively to persist since the work of early commentators such as Marc Prensky (2001) and researcher James Gee (2003). Digital badges are at the intersection of "gamification" (using game elements) and use of the underlying mechanisms of the games. According to Deterding (2012):

> Recently, the lessons to be learned from good video games have been extended beyond the literal design and use of games for learning to the use of game design principles to conceive of a different way to organize instruction, turning formal education itself into a game-like experience. (as cited in Fishman et al., 2013)

2.5 Summary

Conceptually, the idea of awarding badges as an outcome, or in combination with a performance assessment in an open, potentially socially mediated and authenticated system to assess, guide and recognize informal learning is deeply grounded in current theories of how people learn, including situated cognition and motivation. For example, the fact that the performance benchmarks are readily available propagates self-regulated learning and fosters the development of metacognition on the individual level. It also facilitates discussion and inquiry which are the foundation of participatory culture and at the heart of knowledge making in a social constructivist manner. The idea of badging systems for assessment is aligned with the concept of participatory cultures. It is also powerfully aligned with theories of motivation in learning. Digital badges leverage many of the strengths of digital media, participatory cultures, ICT as well as foster mastery learning and the formation of positive STEM identities.

3 Case Study Details

3.1 Overview of the Study

A mixed methods study was conducted to assess the impact of a digital badge intervention for STEM learning in a formal secondary learning context. The study explored the perceptions and attitudes of participants regarding the use of digital badges and their learning trajectories for learning, including pedagogical aspects used in implementation such as teaching strategies and feedback practices. An exploratory approach is appropriate because of the emergent nature of research in the use of digital badges in formal education contexts. "Exploratory studies are quite valuable in social science research. They're essential whenever a researcher is breaking new ground, and they almost always yield new insights into a topic for research" (Babbie, 2010, p. 93). A mixed methods design was selected due to "a major advantage of mixed methods research is that it enables the researcher to simultaneously ask confirmatory and exploratory questions and therefore confirm and generate theory in the same study" (Teddlie & Tashakkori, 2009, p. 20). The objective of the research was to explore how digital badges, used as an educational intervention with specific pedagogical practices, may impact the learning of STEM content and practices in the secondary school sample of underserved students.

3.2 Significance of the Study

Although it has been widely assumed that the use of digital badges impact learning, both positively and negatively, there is a lack of empirical data to measure effects. Essentially research "related to incentives, motivation, and learning on badge-based learning …in its infancy" (Bowen & Thomas, 2014, p. 25). In particular, the premise that digital badges will affect participant motivation has been repeatedly asserted, but "there is little research that examines how badges interact with student motivation" (Abramovich, Schunn, & Higashi, 2013, p. 218).

The findings of this study contribute to the emerging knowledge base about the use of digital badges systems for learning in secondary learning contexts. This research also contributes to the practical aspects of designing learning trajectories, which incorporate sound, research-based principles of teaching, learning, and motivation. In addition, the use of digital badges may provide scaffolding, tools for flexible assessment and may propagate the deep learning of key STEM concepts in connected learning contexts.

The ultimate goal of this work was to inform educational practitioners and policy-makers in addressing authentic problems of practice–to enhance learning of STEM knowledge, concepts, and practices to all youth, particularly learners in underserved communities.

3.3 Rationale and Purpose

The objective of this research was to explore the use of digital badges as an educational intervention in the learning of STEM competencies aligned with NGSS *Practices*, in a specific, secondary school context. Student characteristics important to effective learning and a positive STEM identity including motivation, persistence, self-efficacy, and task value were measured. The digital badges designed for the study were standards-aligned with robust learning trajectories articulated through badge criteria, and suggested assessments of learning. They were designed to scaffold the acquisition of STEM content knowledge, practices and habits of mind. Data describing the learning environments, which could affect program implementation were collected through both quantitative and qualitative measures and then analyzed. These data also included teacher and leadership factors.

Although digital badges have been used successfully in other technology-mediated instructional systems such as educational games, understanding how (if) digital badges function as an intervention for learning and instruction is largely unexplored. The "nascent nature of STEM badges," and in light of the fact "to date, few journal articles focus specifically on badges," "the potential efficacy and methods of application of digital badges in K-12 populations are currently unknown" (Riconscente, Kamarainen, & Honey, 2013, p. 2). Funded by the National Science Foundation to explore "Badge-based STEM Assessment," Riconscente et al. (2013) reported that there are "novel affordances badges bring to the current context of STEM learning," with "potential …for supporting deeper student engagement, substantive opportunities for learning STEM content, and a greater transparency of underlying assessment criteria," (Riconscente et al., 2013).

3.4 School Context and Learners

The digital badge intervention programs were implemented over a course of 3–6 weeks during the 2013–2014 school year, in a charter school system (publically funded, independent schools) in the Midwest with a large English as a Second Language (ESL) population; Arabic is the primary language spoken in the home. The site was invited to participate in the study because of its previous adoptions of innovative instructional practices, and its student population which is socio-economically, linguistically and culturally diverse. According to Fall 2013 data, the school has a free and reduced school lunch rate of 87 % (Center for Educational Performance and Information, n.d.).

The total number of student participants was 72, with 20 students in 7th grade, 32 in 10th grade, 2 in 11th grade, and 18 in 12th grade; data for the 11th grade students was excluded from the analysis because of the small number of participants. Two teachers successfully completed the entire digital badge study. The units of analysis for the study were: 1) individuals (students and teachers), and 2) groups of individuals interacting in learning contexts (e.g. classes or groups of students). The digital badge interventions took place in a social studies class (7th grade) and in two high school math courses (algebra and Business math).

3.5 Methodology

3.5.1 Research Design

There are a wide variety of mixed methods designs. They are often categorized according to the purpose of the research, the methodological emphasis, or the sequence of methodological integration. An evolving field, mixed methods does not yet have an established nomenclature (Teddlie & Tashakkori, 2009). This study was a concurrent or parallel (Teddlie & Tashakkori, 2009), or concurrent triangulation (Creswell & Plano Clark, 2007) mixed methods design. The study comprised quantitative analysis of survey data and thematic analysis of qualitative data, collected from a variety of sources. Qualitative data were collected from a post-program, semi-structured interview (focus group), personal communications, open-text survey questions, and artifact analysis of student work. This design is used to confirm and corroborate findings, with the data being integrated during the interpretation phase (Creswell & Plano Clark, 2007).

A mixed methods research design, which combines survey data with qualitative methods, is consistent with strategies advocated by researchers working with mixed methods research (Andres, 2012; Creswell, 2008; Creswell & Plano Clark, 2010; Creswell & Plano Clark, 2007; Plowright, 2011; Teddlie & Tashakkori, 2009). This design is appropriate for studying the attitudes and student characteristics of participants.

3.5.2 Research Questions

A main focus of this research was the question:

1. *How does the use of a digital badge intervention for STEM learning impact student*: *motivation*, *task value*, *learning goal orientation*, *self-efficacy*, *learning behaviors and strategies*, *including self-regulation and persistence-at-task*?

3.5.3 Measures

Students responded to surveys before and after the digital badge program on their attitudes and opinions regarding STEM learning and the digital badge program. In addition, data were collected about student learning behaviors as well as their ICT and digital media use. In order to measure the construct of motivation in learning STEM skills, competencies, and knowledge, several sub-scales from the *Students' Adaptive Learning Engagement in Science Learning* (*SALES*) (Velayutham, Aldridge, & Fraser, 2011) scale were modified and implemented as intensity scales with values of 1–20. The following SALES subscales, consisting of 4–8 items, were used as measures in both the pre- and post-treatment: self-efficacy, (learning) goal orientation, task value, self-regulation and learning behaviors. In the pre treatment, students were asked about their learning in STEM content whereas in the post treatment, students were asked about their learning in the digital badge program (which focused upon STEM content).

The pre-program questionnaire was comprised of 40 questions. In addition to the *SALES* sub scales, the instrument included ranking and interval items to measure ICT use, digital media use, and learning behaviors. The student post-program questionnaire was comprised of 33 questions. In addition to the *SALES* sub scales, items were included to assess student attitudes about the digital badges and learning behaviors used during the program. The post program student survey included additional intensity measures (from 1 to 20), ranking, interval and open text questions.

3.6 Procedures

3.6.1 Study Preparation: Digital Badge Intervention

Three digital badge series were designed to scaffold learning, provide criteria for measurement, and to establish guidelines for assessment and learning in select STEM concepts and practices. Digital badge learning targets were aligned with the NGSS standards articulated by the National Academy of Sciences in *A Framework for K-12 Science Education*: *Practices*, *Crosscutting Concepts*, *and Core Ideas* (National Research Council, 2012). The core ideas are organized into three dimensions which are recommended for integration into K-12 STEM curricula and instruction. The specific digital badge learning targets, performance tasks, and assessment criteria were developed in collaboration with a middle school science and math teacher and reviewed by several others.

The National Research Council (NRC)'s Framework is divided into three dimensions: Practices, Crosscutting Concepts, and Disciplinary Core Ideas. *Scientific and Engineering Practices* (Dimension 1) requires significant proficiency in higher order thinking skills: analysis, evaluation, synthesis, and the application of tacit concepts and ideas. "The NRC uses the term practices instead of a term like 'skills' to emphasize that engaging in scientific investigation requires not only skills but also knowledge that is specific to each practice" (NGSS Lead States, 2013). The practices require opportunities to apply knowledge and to ultimately gain the kind of tacit professional knowledge acquired through professional practice in the field. Mastery of the practices is consistent with the idea of *epistemic frames* which "are described as the ways of knowing, of deciding what is worth knowing, and of adding to the collective body of knowledge and understanding of a community of practice" (Shaffer, 2006, p. 223). This is also consistent with the view of the learning as *situated cognition*, occurring in communities of practice (Brown et al., 1989; Lave & Wenger, 1991; Wenger, 2000). It also supports the view of "Science as a Process of Participation in the Culture of Scientific Practices" (Duschl et al., 2007, p. 29).

Eight science and engineering practices are described and defined in the *NGSS* framework. Due to their inherent complexity, mastery of these practices is difficult to assess in traditional, formal learning contexts. Formal learning contexts rely heavily upon standardized testing measures (Gilmer, Sherdan, Oosterhof, Rohani, & Rouby, 2011). The Practices provide suitable competencies and learning objectives for the pilot digital badge intervention. The badge criteria can include performance tasks which require mastery of concepts as demonstrated through diverse products of learning.

Three digital badge series with five levels were designed to spiral and scaffold skills development for the study: *InfoMaker*, *Data Whiz* and *Data Hacker*. They are aligned with the following:

- select Next Generation Science Standards Dimension 1 Practices
- Common Core State Standards (CCSS) in Math (Common Core State Standards Initiative, 2014b)
- English Language Arts (Common Core State Standards Initiative, 2014a)
- National Educational Technology Standards for Students (NETS-S) (International Society for Technology in Education (ISTE), 2007)
- Partnership for 21st Century Learning (P21) (Partnership for 21st Century Skills, 2009) standards.

Intentionally, some competencies did not align specifically with standards because existing frameworks are not applicable and therefore alignment would result in restrictions on learning products. In particular, these include competency in higher order thinking skills, or digital media consumption and creation. The design of the badge curriculum framework incorporates the idea of spiraled curriculum (Bruner, 1976). It also includes Gagne's theory of varieties of learning, and articulation of learning outcomes, as instructional objectives and practices (Aronson & Briggs, 1983). Furthermore, the digital badge design incorporates theory-based practices of mastery learning. The design also incorporates feedback to assess the student learning process and to gauge effectiveness of instruction (Guskey, 1996). The badge learning targets and criteria were designed by working backwards from learning targets (Wiggins & McTighe, 2005). The learning targets represented steps along a learning path or trajectory, consistent with the premise of *instructional design* for effective learning (Reigeluth, 1983; Smith & Ragan, 1999).

The badge learning trajectories were presented as either curriculum documentation for school administrators and teachers, or as *stories* in the Makewaves learning management system and digital badging platform. The *stories* or blog posts, were written in language accessible to target youth participants. The curriculum documentation included the following: badge overview, learning targets, badge skills, performance objectives, suggestions of evidence of achievement (examples), alignment with Bloom's Taxonomy, standards and frameworks alignments, learning resources. The story versions of the digital badge details included an overview of what the learner must do to earn the badge, an estimate of the time necessary to complete the badge requirements, and a description of the skills to be developed through the process.

Instructional resources and supports. Program materials were developed to explain digital badge instructional processes, procedures, and goals. These included an implementation manual and other documentation, teacher resources, and supports. Training, documentation, and curated resources, in the form of dynamically generated lists or visual aids, were created and shared.

Learning management system. The Makewaves (www.makewav.es) social learning system was selected as the digital badging platform for the study. As a secure learning system (LMS) and digital badging platform, it was suitable for minor participants. A project web site was created on the Makewaves platform (www.Makwav.es/badgebox) to share study information, to organize participants into groups, and to award student and teacher digital badges.

3.6.2 Implementation: Data Collection and Analysis

The study was implemented over 3–6 weeks during which the students worked on teacher-guided or approved projects to earn digital badges. Teacher A used the badges to supplement existing coursework and worked primarily with the *Data Hacker* badge series. Teacher B applied the *InfoMaker* digital badge series for a project in social studies; students were instructed to research a *problem* in a country or region, then provide a solution. Students completed surveys, pre and post intervention. A semi-structured, post project focus group was conducted with the teachers.

Descriptive and inferential statistical analyses, including factorial analysis and regressions were conducted. In addition, qualitative analysis was conducted on the transcribed interviews which were analyzed for emerging themes using nVivo. Open text questions from the Student Post Survey were coded online using the text analysis tool. Artifact analysis was conducted on the student work in the 7th grade social studies class. The results are abbreviated for publication.

3.7 Findings

This study investigated the overarching research question:

How does the use of a digital badge intervention for STEM learning impact student: *motivation*, *task value*, *learning goal orientation*, *self-efficacy*, *learning behaviors and strategies*, *including self-regulation and persistence-at-task*?

Due to space limitations for this publication, the data below represents a snapshot of the main findings. Specifically, measures which together, comprise the construct of "motivation" are reported, and qualitative findings which describe teacher viewpoints on the digital badges as pedagogical tools.

3.7.1 Quantitative Data

Paired sample T-test analyses were conducted on pre and post measures of student attitudes and beliefs of self-efficacy, self-regulation, task value, and goal orientation. Sub scales from the *SALES* instrument were used, which together measure student motivation, in this case on STEM content and using digital badges for learning STEM content.

Table 27.1 Paired samples test: measures of self efficacy

	Sig. (2-tailed)
I can master the skills that are taught.	.006**
I can figure out how to do difficult work.	.007**
Even if the work is hard, I can learn it.	.001**
I can understand the content taught.	.050*

Significance levels ** $p < .01$, * $p < .05$

There was no statistically significant difference in measures of student goals, except for a comparison of performance goals. "In my class or program, it is important to get good grades" (Q. 32, pre-program) and "In the digital badge program, it is important to earn badges" (Q.18, post program). For analysis, the file was initially split by grade, then by gender. There was a significant grade level difference of 0.027 in the 12th grade, significant at the $p \leq 0.5$ level, with the comparison of means, indicating that students responded that grades were more important. Of interest, the comparison for 7th grade resulted in an identical mean value of 16.778 (with SD of 4.0520 and 4.8210 for the pre and post measures respectively). There was a significant gender difference for boys at 0.005, which is significant at the $p \leq 0.01$ level; boys responded that the digital badges were not important as grades. The girls' response was similar, except girls valued the badges more, hence the lack of statistical significance between the means.

There was a difference in pre and post mean values for the question "What I learn is interesting" of 0.13, which is significant at the $p \leq .01$ level.

Self-Efficacy and Self-Regulation Pre and Post Measures

There were several items with statistically significant differences between the pre and the post measure for self-efficacy, three of which (see Table 27.1) were significant at the $p \leq .01$ level. "I can understand the content taught" has a significant pre and post program difference, significant at the $p \leq .05$ level.

Several pre and post program measures of self-regulation were statistically significant to the $p \leq .01$ level (see Table 27.2). These measures indicated students' willingness to persist at task and to "concentrate" or to pay attention, which was significant to the $p \leq .05$ level.

Factorial Analysis

The results of the factorial analysis suggest that the post-treatment measures of self-efficacy and self-regulation differ in composition from the pre-treatment measures. The pre-treatment factors loaded on to either self-efficacy or self-regulation, only, which is anticipated because of the use of the adapted SALES survey questions which are designed to measure these attributes.

Table 27.2 Paired samples test: measures of self-regulation

	Sig. (2-tailed)
Even when the tasks were uninteresting, I kept working.	.004**
I worked hard even if I did not like what I was doing.	.000**
I continued working even if there were better things to do.	.005**
I concentrated so that I did not miss important points.	.050*

Significance levels ** $p < .01$, * $p < .05$

Items loading (values of 0.7 or higher) onto factor Self-Regulation A Post reflect students' self-regulatory and persistence in learning behaviors as self-reported in the *digital badge program*. In addition, students' belief about the importance of understanding the work (self-efficacy) and earning badges in the program loaded onto this factor:

- persistence in working when *tasks are uninteresting*
- persistence in working hard when *I do not like what I am doing*
- *concentrating* to *not miss important points*
- persistence when there *are better things to do*
- importance that *I understood my work* and the
- importance of earning *badges in the badge program*.

Items loading (values of 0.8 or higher) onto factor Self-Regulation B Post describe students' self-regulatory learning behaviors and self-efficacy regarding in the digital program as well as measures of self-efficacy about their performance:

- *I am good at these subjects*
- *I can understand the content taught*
- *I will receive good grades*
- finishing *work and assignments on time*
- persistence *even when the work is difficult*
- *concentrating in class or in the program* and
- persistence in working until the tasks are completed.

Qualitative data were used for confirmatory analysis and to generate emergent theory about the use of digital badges in similar contexts. Furthermore, qualitative data provided additional insights into instructional and assessment practices, and it also described the processes of implementation.

Instructional Processes

The preparation necessary for the Digital Badge program was "minimal" (Teachers A and B). It consisted of reviewing the materials, including the badge criteria (2–3 h each), and preparing student materials: "So it didn't take that much planning time. And again, it's planning that you already would have done for your classes anyway."

Teacher A had made a shift in goals for the school year and she considered the digital badge program aligned with these objectives: “I think with my class this year—and this is not just digital badges—I shifted the focus from content to skills. So I’ve tried to build skills-based assessments throughout the year, and this just kind of played into that.” Teacher B concurred, “This is probably the way I would prefer to teach, because it’s all of them doing it on their own, and figuring out that they can, and that’s cool” (Teacher A).

The digital badge program was viewed as a strategy or pedagogy: “It’s just one more strategy to get that one little cohort [*hard to reach*] of students on board with something.” (Teacher A).

About the authentic applications or context: “Usually they totally shut down on that stuff. But to tell them ‘I want you to work through it so you can earn this [digital badge]’ … then they are a little more persistent with that” (Teacher A). Teacher B used a different teaching strategy and an authentic context: “The biggest thing was that in *InfoMaker*, they had to come up with resources that they needed, and all the materials to fix their problem. And I made them be extremely specific with that. I made them come up with basically everything that they could ever possibly imagine needing: how much each thing costs. And when they really had to think about that—that was pretty tough. That was probably one of the hardest things for them, is to *really* explain what’s needed to fix their problem.”

Assessment Practices

Teacher B implemented the digital badges as part of an extensive array of formative feedback strategies (see **Feedback processes**, below). Of particular note, Teacher B inserted another “step” in which students self-evaluated against the digital badge criteria, before submitting work to the teacher, fostering critical metacognitive skills. Having clear badge criteria, that is, clear learning targets, enhanced the feedback process by giving students and the teacher specific goals against which to gauge performance.

Products of learning. Teacher B remarked on the quality of the 7th grade Social Studies projects which were created for the digital badges program (Fig. 27.1):

> There were definitely different products, and some of them were actually phenomenal. That was maybe five of them, were … incredible. And holy smokes, I can’t believe they put that much work into it. And then 10 of them were pretty dang good…

Teachers: General Observations and Comments

In comparison to the regular class work, the digital badge program provided opportunities for authentic applications: “Yeah, I have the same problem in math, too. I need you to learn the procedure, but the whole point is to apply it to real world context. … the digital badges were nice, because we are taking a real world

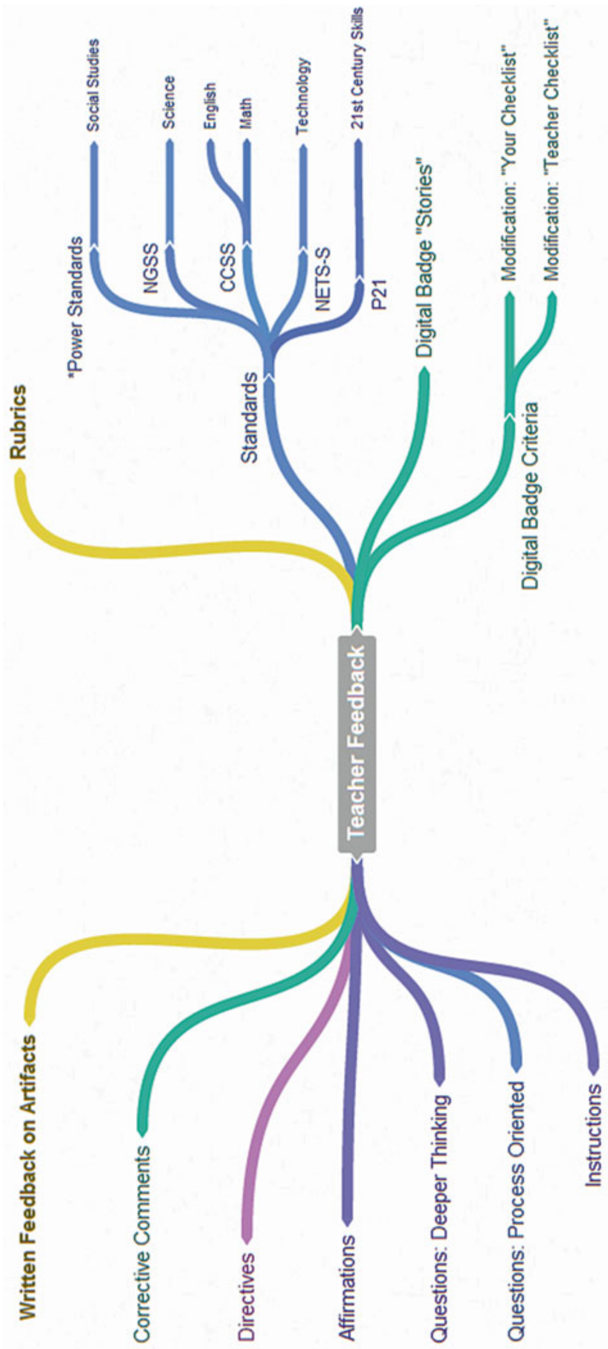

Fig. 27.1 Teacher feedback

problem, or real world data, using those procedures we use in class normally,. But there's a whole other point to it now" (Teacher A).

About watching students as they worked through problems, Teacher B commented: "Which was kinda nice for them—and me—because I got to watch them be proud, and then they really got to be frustrated before they figured something out, and then they were really proud of it as well…"

Teacher B elaborated on the learning processes and using the digital badges to encourage students to persist at task: "… it was fun." Teacher A also commented: "But students get the mentality that this is the kind of student that I am. And this is the kind of work that I do, and that's that. But if you have something that they are interested in, like badging, or making it more like a game, or levelling up, then they might motivate them more to try the harder stuff"

Of particular interest, Teacher A compared the grading experience of students with job performance metrics:

> I mean, it's the same with the students. We take you and all of these wonderful things about you, and all of these interests you have, and then we bubble down a GPA letter, or number or something. As a teacher, you kind of feel the same way. You put in all this work, and now you're just checking boxes. So is there another way to kind of supplement that, to show what you are good at?

Students

In the beginning, students were apparently confused about how to proceed, and they struggled with the format of the digital badges: "Some of them thought it was really strange, that they got to do whatever they wanted. And that…there wasn't an obvious answer, and that they… really had to think about it" (Teacher B).

> With Algebra, it's more like we do a unit, and you take a test kind of thing. So with this being more open and independent, there was some anxiety -- that we talked about. When you kind of give them this freedom, they don't know what to do with it. (Teacher A)

Teacher B explained:

> Our students here are, I think most students…Just the way the curriculum is made in textbooks, and all that stuff. They are used to Question, Scan, Answer, Copy, Paste, and then you know, write it down. So with this… so that they were pretty confused when there wasn't an obvious answer to things. There's not so much creative learning that this provides.

Initially, the students were concerned about the expectations and work for the digital badges: "So there was more anxiety, and a lot more questions in the beginning. 'How do I do this?' and 'How am I going to get the grade?' and 'How…' this and that, but once you kind of get past that stage, I think they kind of appreciated more" (Teacher A). In Teacher B's class, the two-step system was used, where students were asked to go through their own checklist of badge criteria before work was submitted to the teacher. "Yeah, but sometimes they were pretty frustrated, because they were positive they were done, and they weren't."

As the program progressed, the students enjoyed working with the badges: "I think with my students, they really got on board with the idea that this is supposed to measure things that you are good at… that you are not getting measured at school." Teacher A described how students felt about traditional grading systems: "I guess at the high school level that there are a lot of students that feel either disenfranchised or misrepresented by their grades, or kind of the whole system, traditionally, how their academics are." The capabilities of digital badges transcend *grades*. Teacher A continued: "So to tell them so to look at some of the students who are not doing well academically, but are really great with other skills, other tasks, and letting them know this is the whole point, this is for you to bring that in, a lot of them got on board with that and thought that was nice. They like the connection, the gaming, like just having fun, and earning something… that to them is outside what you would normally do in class."

4 Conclusions

Learners languish as skills gaps widen. A paradigm shift in our educational outcomes and processes is clearly necessary. Although many questions remain about the use of digital badges to scaffold, evidence, and communicate learning, crucial conversations about learning have reached a tipping point. Globally, there is interest in acknowledging and leveraging skill sets earned in out-of-school contexts for economic growth and equity.

Digital badges with robust learning trajectories can empower and motivate learners. They have potential to foster skills and habits of mind for engaged STEM learning. Digital badges can evidence the creativity, higher-order thinking and problem solving skills necessary for STEM disciplines and careers. Youth can learn the skills and language of communities of practices through authentic learning experiences, and ultimately, through the process of acculturation, develop positive STEM identities.

The findings of the study are that standards-aligned digital badge innovation was effective in increasing student motivation in this student population. There were several statistically significant increases in measures of student self-efficacy and self-regulation. Students and teachers reported a willingness to persist at tasks to earn the digital badges as well as increased product quality and complexity, particularly in the 7th grade social studies class. Measures of student perceived competence in task completion increased in the post measure.

The majority of student participants enjoyed using the digital badge program to learn. This was particularly evident in the qualitative data, students' written responses, and as reported by the teachers. For example, students reported that the digital badges for learning were *cool*, *a fun way to learn*, that they would like to use them *again*. In addition, students were interested in earning additional badges if the program were longer. The majority of students reported understanding the badge requirements *usually* or *all the time*, and also wanted the opportunity to earn more badges and if the digital badge program were longer. There were no significant differences in task value (interest), with the exception of a difference in pre and post measures of student interest, significant at the $p \le .05$ level ($p = 0.13$). Interest is an essential component of student engagement, necessary for academic achievement.

Learning behaviors were also impacted by the use of the digital badges. Students referred repeatedly to the badge criteria to gauge the completeness of their work. As reported by their teacher, in the social studies class students notably used the badge criteria to check their performance. Such learning behaviors, scaffolded by digital badges, promoted increased levels of self-regulation in learning, enhanced meta-cognitive skills and perceived competence.

The majority of students agreed that the way the badges were structured helped them learn the subject well, and 94 % of students were interested in using digital badges for learning again. Students at every level (7th, 10th and 12th grades) indicated that they could incorporate learning from other contexts into their assignments using the digital badges *some of the time* or more. Furthermore, a minimum of 60 % of students at every grade level were interested in where to earn digital badges for out-of-school learning.

The younger students in particular, indicated that they understood the content more using the digital badges. The 7th grade students and their Teacher (B) worked collaboratively through formative feedback using the digital badge criteria as learning (and assessment) targets. Students thought the organization of the badge criteria was helpful in the learning process.

4.1 Motivation

As a complex construct, motivation is inferred by the presence of other attributes, such as self-efficacy, choice, persistence-at-task, and interest. For this population, many of these indicators had measurable, statistically significant differences. It is important to note that the pre and post measures were comparable, but did not measure the same constructs (self-efficacy in STEM subjects versus the digital badges based around STEM content).

When students were asked what they would say about working with digital badges, the responses were positive. They spoke about how the badges were *motivating*, *fun*, *make things easy*, and that they were a *good way to learn*. Of particular interest, when students were asked what they would change about the experience of learning with digital badges, many talked about changes they would make in their *own attitudes or approaches*, versus the badging processes or design.

Teachers also agreed that the digital badges were motivating for students, particularly students who weren't regularly successful with traditional assessments.

Students were able to include learning from other contexts, and liked this aspect of the digital badges.

4.2 Student-Level Factors

Despite a low income context, the students are very much interconnected via ICT. Their favorite online activities are using digital games and media, communications and social media which reflect use as consumers versus producers of digital artifacts.

Digital badges are designed to reside online, to be shared with select audiences. The student population for this study did not actively share their badges. This may be due to cultural biases against *bragging*, or concern for *envy* and a cultural/religious propensity for modesty. Students may have equated the digital badges earned in class as analogous with grades or other accomplishments, which they tended not to share.

During the digital badge program, students reported being able to integrate learning from other contexts into their assignments a substantial amount of the time. Students agreed that they would like skills and knowledge from out of school learning to *count*. They wanted to know where they could earn more digital badges for learning.

4.3 Learning Environment and Implementation Factors

As an instructional tool, the digital badges supported existing curriculum; Teachers A and B reported a shift in learning goals and outcomes toward learning skills or competencies, and the badge learning trajectories were aligned with this goal. The digital badges aligned with an instructional goal for the school year to emphasize transferable skills or competencies (Teacher A). This idea of flexibility of content and context for learning skills was demonstrated by Teacher B who successfully integrated *InfoMaker*, a badge series aligned with Next Generation Science Standards, into a social studies class. Use of the digital badges required minimum preparation *that you would do anyway* (Teacher A).

The digital badges functioned as both formative and summative feedback strategies, and the students persisted with their tasks to earn the badges. Due to limited technology resources, students in the 10th and 12th grades were more likely to view actual printed badges on the windows of their classrooms (Teacher A).

These findings are of interest to educators and policy makers. Although it is not possible to generalize the findings of this research, due to the small, homogeneous student sample, the results of the study are promising. A great deal of research is needed, however, to understand how digital badges may function in different learning contexts and for whom (different student groups). Suggestions for future research include additional study on the design principles for standards-based digital badges, validity and transferability of skills, instructional practices and innovations using digital badges as well as research to understand the theoretical basis and best practices in using digital badges for motivating students.

5 Digital Badge Samples

Will be available at www.badgebox.net/research (to be constructed)

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Part V
Epilogue

Chapter 28
Moving Forward with Digital Badges in Education

Dana-Kristin Mah, Nicole Bellin-Mularski, and Dirk Ifenthaler

Abstract Digital badges are an emerging technology in education that symbol achievements, knowledge, skills, and competencies in various educational contexts and thus contribute to meaningful learning pathways. This edited volume presents a collection of works and findings on digital badges from multiple perspectives concerning education: theoretical approaches, design implementations of badging systems as well as various case studies and research findings, which give valuable insight into practical experiences and challenges in twenty-first century learning experience. This epilogue provides an analysis of the previous chapters with focus on three major themes that have emerged: (1) the impact of digital badges on learning and assessment, (2) digital badges' design and technological considerations, and (3) stakeholders' perspective on digital badges concerning acceptance. We aim to move forward with digital badges in education and therefore conclude with directions for further research on digital badges in different educational contexts such as K-12, higher education, and organizations.

Keywords Digital badges • Motivation • Assessment • Instructional design • Badging system

D.-K. Mah (✉) • N. Bellin-Mularski
University of Potsdam, Karl-Liebknecht-Str. 24-25, Potsdam 14476, Germany
e-mail: dana-kristin.mah@uni-potsdam.de; Nicole.bellin-mularski@uni-potsdam.de

D. Ifenthaler
University of Mannheim, L4, 1, Mannheim 68131, Germany

Deakin University, Melbourne, VIC, Australia
e-mail: dirk@ifenthaler.info

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1 Introduction

This edited volume provides a broad collection of theoretical foundations, technological frameworks, design considerations, and practical research on digital badges and micro-credentials. It represents a unique collection of various approaches and insights into digital badges in the context of education.

This epilogue presents an analysis of the 27 chapters with key themes that emerged as well as directions to further research. This epilogue will contribute to new perspectives on digital badges and shall enrich as well as open up dialogues about their use in diverse educational contexts.

Following an overview on the concept of digital badges in education, three major themes that appeared in the chapters are discussed. The first theme concentrates on the impact of digital badges on learning and assessment with regard to motivational aspects, new forms of assessment, competence-based approach, and lifelong learning. The second theme focuses on learning and instructional design considerations as well as technological frameworks of digital badges such as badging systems and design guidelines. The third theme considers the importance of stakeholders for the implementation of digital badges. We conclude with a discussion of implications for future research. More research is needed into this relatively new technology to explore its full potential for educational uses.

2 Digital Badges in Education

Digital badges are an emerging educational technology. Using symbols to indicate achievements, knowledge, skills, and competencies has a long tradition. Ellis, Nunn, and Avella (Chap. 1) give a detailed historical overview on the development and utilization of traditional badges and digital badges. In this book different perspectives and terms for "digital badges" have emerged. For example, Ellis et al. refer to "digital badges", Everhart (Chap. 12) to "open badges", and Willis, Flintoff, and McGraw (Chap. 2) as well as Grant (Chap. 6) use the term "open digital badges". For consistency, we refer to "digital badges" in this chapter.

Digital badges offer the opportunity to recognize learning anytime, not only in formal but also in informal learning environments. In addition to the recognition and bridging of learning inside and outside educational institutions, main roles of digital badges in education include motivational effects, signaling of achievements, and capturing learning paths (Gibson, Ostashewski, Flintoff, Grant, & Knight, 2013; Jovanovic & Devedzic, 2015).

The functions and values of digital badges may vary with regard to the educational setting. Thus, digital badges can be utilized in K-12, in higher education, in organizations, workplace learning, and for professional development. West and Lockley (Chap. 26) indicate that digital badges can be useful to connect learning pathways, for instance between vocational education, higher education, and other training providers.

Overall, digital badges aim to link individuals' learning experiences and document lifelong learning pathways. In this regard, digital badges can be shared via professional networks and social media platforms, for example with potential employers (Glover & Latif, 2013).

3 Different Perspectives on Digital Badges

While various perspectives on digital badges have emerged from the chapters of this book, three major themes shall be highlighted and further investigated: (1) digital badges' impact on learning and assessment, (2) digital badges within instructional design and technological frameworks, and (3) the importance of stakeholders for the implementation of digital badges.

3.1 Digital Badges' Impact on Learning and Assessment

Learning takes place in a variety of settings and learners construct knowledge and demonstrate competencies in many different ways. Digital badges offer a way to visualize these different achievements and thereby focusing on skills and competencies. Gibson, Coleman, and Irving (Chap. 7) connect learning in and outside formal institutions (e.g., school, high school, higher education, volunteerism) by focusing on the potential of digital badges to bridge these different settings and recognize personalized learning pathways. Digital Badges can serve as a portfolio that provide detailed information about the learners' skills and competencies beyond academic qualifications and thereby offer increased access to opportunities for further education. From an organizational point of view, digital badges can serve to visualize staff development and awareness for professional development activities. Hamson-Utley and Heymann (Chap. 13) explore this field of application and consider aspects of implementation.

Digital badges not only recognize personalized learning paths they also have an impact on learning and learning motivation. So far, there are few empirical findings concerning the question how badges exactly affect learner motivation. Abramovich, Schunn, and Higashi (2013) conclude in their study that patterns of badge acquisition differed according to the prior knowledge level of the learners and that different badge types affected different learner motivation. The concern that badges support extrinsically motivating learning strategies remains still a controversial aspect. Elkordy (Chap. 27) provides evidence that digital badges can foster learning behaviors like self-efficacy and self-regulation as well as problem-solving skills.

These findings have implications for designing learning environments. Drawing on game-based frameworks, Beattie (Chap. 17) and McDaniel (Chap. 18) discuss motivational aspects of badges in video games regarding autonomy, mastery, and purpose as well as the need to design badging systems in educational contexts with enough complexity to motivate different types of learners at different stages in their learning process (Eseryel, Law, Ifenthaler, Ge, & Miller, 2014). Furthermore, questions of conceptualization of learning pathways and learning trajectories as well as the operationalization of skill and competence levels in learning trajectories in badging systems still need to be explored.

Unlike traditional assessment practices digital badges offer a flexible approach to assessment, represent varying degrees of mastery, autonomy, and maintain immediate feedback for the learner (Ifenthaler, Eseryel, & Ge, 2012). In their theoretical model, Wills and Xie (Chap. 14) discuss implications for designing learning environments with digital badges by drawing on theories of self-regulated learning, self-efficacy, and game motivation. The authors argue that for an effective implementation badging systems need to be heterogeneous and individualized which represents a challenge to educators as well as administrators.

These assumptions on the effects of digital badges on motivation are connected to various aspects of assessment. Although digital badges can be integrated in traditional credentialing systems, for recognizing unique learning paths, processes, and outcomes a competency-based approach to assessment is required. Digital badges can be part of e-portfolios and allow assessment of learning and assessment for learning as Buchem (Chap. 19) describes. Digital badges are not an assessment instrument, but work as indicators of achievement, which need to be integrated in assessment frameworks. How these frameworks are structured depends on the purpose of the digital badge and has implications for the implementation of the digital badge in a learning environment and badge ecosystem.

3.2 Digital Badges Within Learning and Instructional Design and Technological Frameworks

Digital badges offer a range of opportunities to recognize individual learning paths. Implementing digital badges and designing learning environments accordingly presents a challenge and requires careful planning. There are a number of different badging platforms and it is often difficult to choose a platform for a specific application. The Open Badge Infrastructure (Mozilla Foundation, 2012) offers features for collecting, issuing, and displaying digital badges, and is a global standard framework for documenting and distributing badges. The Open Badge Infrastructure allows for the portability of badges and the ability to exchange with other badging systems or learning management systems. In the Open Badge Infrastructure the badge is provided with an image and metadata that gives information how the badge was earned and further assertion specifications.

In their comprehensive overview Dimitrijević, Devedzić, Jovanović and Milikić (Chap. 8) give an analysis of different platforms and evaluate these according to different scenarios. Given these different platforms with different features and applications it is important to consider design guidelines before, during, and after development as well as implementation of digital badges to be effective for learners.

Newby, Wright, Besser, and Beese (Chap. 10) discuss these key issues that have to be addressed and introduce Passport by Purdue as an instructional tool to demonstrate the different steps of digital badge creation in higher education. Thus, learning and instructional design considerations differ according to the intended use, learner group, or institution. Case studies presented by Aberdour (Chap. 11) give valuable insight into the application of digital badging systems and instructional design considerations. For example, in higher education an instructor can issue a digital badge but badging becomes more effective when it is integrated in the assessment system and is embedded in the program and curriculum of the institution.

Some aspects in the implementation and design framework still need to be answered as Lockley, Derryberry, and West (Chap. 4) point out, for example issues of acceptance, validity, criteria for earning the badge, and security of data. Finally, acceptance and value of digital badges are strongly linked to a high level of control of accreditation.

3.3 The Importance of Stakeholders for the Implementation of Digital Badges

Stakeholders' acceptance is crucial for the implementation of digital badges. West and Lockley (Chap. 26), for example, emphasize that a successful badge system depends on the institutions' communication to provide a clear understanding by all stakeholders on how digital badges work. Gander (Chap. 5) underlines to consider stakeholders' expectations of digital badges and Grant (Chap. 6) argues that the building of collective belief in digital badges is fundamentally for their implementation. Metzger et al. (Chap. 25) emphasize the importance of the user experience when implementing digital badges in organizations. Thus, in order to increase employees' professional development, badges should be designed as relevant and meaningful rewards for learners (Grant, 2014). Glover (Chap. 24) analyzed students' perceptions on digital badges without providing them with the information of receiving digital badges instead of paper certifications for their co-curricular achievements. While having no understanding of digital badges' purpose, participants did not see much advantage over traditional certificates. In contrast, a study by Põldoja and Laanpere (2014) revealed students positive attitude towards digital badges. Findings indicate that students could see even more value in digital badges, if they were an integral part of the assessment in higher education. Hence, Glover also suggests more research into how digital badges can be used as part of the formal curriculum.

4 Moving Forward: Further Research on Digital Badges

Based on the previous chapters, various research areas can be identified. While digital badges can be utilized in various educational contexts, their purpose and value may differ.

Regarding K-12 education, Fontichiaro and Elkordy (Chap. 16) emphasize that the implementation of digital badges depend on organizational aspects of schools as institutions. Particularly with regard to schools' culture, political, social, familial, and other influences are complex factors that should be considered. Besides, schools already have many analogue programs to earn points, such as sticker charts or reading points. Here, more research is needed to provide insight into how digital badges can be meaningful and integrated into different organizational cultures. Elkordy (Chap. 27) researched students from a secondary school with focus on Science, Technology, Engineering, and Mathematics (STEM). She reports that the majority of participants enjoyed using the digital badge program and would use it again for learning. However, students did not share digital badges, although this is one of their central purposes. She hypothesized that this may be either due to modesty or to equality to analogous grades, which are rather not shared. Thus, more research into students' understanding of digital badges and their functions is essential.

Seen as one of the emerging educational technologies, digital badges show much promise. For example, students can earn more granular representations of skills and competencies and present them to potential employers via online platforms. Employers can then search for particular competencies while the digital badges' metadata provides them with further information. In this perspective, digital badges function as an employability tool. However, there is little research on employers' perceptions on digital badges. Glover (Chap. 24) emphasizes that the employers' perspective on digital badges is important as well as to inform them about values and chances of this emerging technology. Rising employers' awareness and understanding of digital badges may also increase students' interest in achieving digital badges and increase desirability among potential earners. Moreover, digital badges may also have a positive effect on students' retention in higher education (The Mozilla Foundation & Peer 2 Peer University, 2012). The visualization of skills can make learners aware of their achievements and encourage further learning, engagement, and persistence.

In organizations, digital badges can be used for professional development programs. However, effects on intrinsic and extrinsic motivation should be considered as well as stakeholders' acceptance. With regard to stakeholder, further research needs to be undertaken to get in-depth insights into their perspectives on digital badges and to gain acceptance for utilizing digital badges in diverse educational contexts. To enhance acceptance and trust, Glover (Chap. 24) argues that a quality control of digital badges is needed. Thus, he suggests robust quality processes for designing and issuing digital badges by the institution. In addition, transparency may validate and justify the digital badges, which is obtained in their metadata (Jovanovic & Devedzic, 2015).

5 Conclusion

Digital badges provide the opportunity to recognize different learning pathways, represent individual competencies and achievements beyond traditional assessment and credentials. This book presents a collection of works and findings on digital badges from multiple perspectives: theoretical approaches, research findings, design implementations of badging systems, and several case studies which give valuable insight into practical experiences. The contributors of this edited volume demonstrate how educational researchers and practitioners explore how to implement digital badges in a meaningful way by focusing on motivational and learning theories, evaluate design principles and different ecosystems, discuss technological requirements, and identify the validity of digital badges by developing meaningful frameworks for assessment.

Meanwhile, there is further research needed on how digital badges can be implemented in different learning environments, how digital badges affect learner motivation and engagement, as well as long term knowledge transfer. The authors of this book also highlight challenges that need to be considered with regard to transparency, access and data usage. Digital badges have the potential to change the way we learn, which has wide implications for assessment frameworks, curriculum design, credentialing, and technological infrastructure. This takes effort and intensive discussion between educational researchers, stakeholders, practitioners, game-, and instructional designers. Therefore, this volume shall initiate the conversation on digital badges and provide valuable insight into their potential to learning in the twenty-first century.

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