Flexible Open Credentials: How Micro and Nanocredentials Can Revolutionize Higher Education

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In 2011, Clayton Christensen and colleagues argued that higher education was on the verge of a major disruption and that the catalyst would be technology. According to these futurists, "Online learning appears to be this technology enabler for higher education" (Christensen et al., 2011, p. 3). In many ways, their predictions have come true, as half of all college students took at least one online course in 2019 (Smalley, 2021), and with the COVID-19 pandemic necessitating near 100% online learning, the door is now open for this trend to grow.

However, in the race to build online courses, most universities missed the point, according to Christensen and Horn (2013): "Many bricks-and-mortar colleges are making the same mistake . . . they offer online courses but are not changing the existing model" (para. 4). One way that higher education has so far failed to change "the existing model" is by failing to create and adopt new forms of student assessment and credentialing. Credentials are a critical part of the learning infrastructure, as they capture student learning via assessment and document students' progress on their learning path. Credentials then communicate this progress to students, employers, and others. Gallagher (2016) argued that "one of colleges' and universities' principal purposes is not only the transmission of knowledge, but also the delivery of certified, reliable credentials that have a special role and standing in our society" (p. xv).

The credentials that higher education awards could be degrees or certificates, but other options have emerged in recent years to represent learning acquired in a smaller portion than a typical 4-year degree or 1 or 2-year certificate. Some of these alternative credential options include microcredentials, Open Badges, nanocredentials, and nanodegrees. There is much debate about what defines each of these credentials (see West and Cheng, 2022), and they are typically based on similar ideas and technologies (such as the W3C Verifiable Credential standard or the 1EdTech Open Badges 3.0 standard). However, in general, Open Badges and nanocredentials represent the smallest chunk of learning—often just a single experience or skill—whereas microcredentials represent larger chunks of learning that do not quite ascend to the level of a full certificate.

These new credential options have emerged in part because our current system of learning credentials often presents challenges in fully recognizing students' learning. Consider the following hypothetical examples:

- Victoria, a brilliant student, completes 80% of her degree, but because of family health challenges requiring her assistance, she drops out of college. After many years and despite all that she has learned and the skills she has gained, she has no degree and no effective way to communicate to others what skills she has. Her years of learning are largely wasted, and she resigns herself to not being able to work in her chosen career.
- Danika, like 65,000 other computer science majors graduating each year in the United States, understands programming languages. However, she also has highly effective relational and communication skills. Her degree in computer science does not describe these important skills and her potential abilities as a bridge builder between programmers and other people within an organization.
- Robert had a personal interest in technical communication while earning his English-literature degree and sought out courses and internships in this area, developing skills in technical writing, graphic design, and media technologies. However, he did not formally earn a minor in technical writing, and thus his English degree does not communicate how Robert's skillset is different from that of a typical English major.

- Ryan speaks a second language and lived abroad for several years. He continues to study this language through MOOCs (Massive Open Online Courses), language apps, and community meetups. He has received some digital certificates from these various places, but they do not transfer to his university. Consequently they do not show up on his official learning record, and he is not allowed into advanced language courses.
- Sarah learned several new technologies at the university, so she volunteered to lead a technology initiative at her school, where she teaches chemistry. However, her degree in secondary education does not explain what her technology skills are, and her principal would like some proof of her ability. She contacts her former professors, but they cannot remember what level of skill she had. She remembers that her professors complemented her on her work, but that positive feedback was never captured in a credential that she could keep and share with others. She can ask one of her professors to write a letter of recommendation, but it will be vague because he cannot remember her performance from several years ago.

These examples showcase several of many possible ways that the current educational credentialing system fails to communicate what students actually know and, perhaps most importantly, how they are each unique persons with distinctive abilities. In our efforts to improve education, much attention has been directed at how the Internet can disrupt educational content, making it free, open, and easily personalizable. However, less attention has been given to how the Internet can disrupt educational feedback and credentials.

Recently, though, technological innovations such as Open Badges, Verifiable Credentials, and Comprehensive Learner Records (West and Cheng, 2022) have opened the door to intriguing possibilities in this area. These digital credentials are similar technologies striving to accomplish the goal of greater transparency and better recognition of all learning a student achieves. They are novel in that they embed evidence of the actual learning in the credential itself. They can also represent learning of different types, including microcredentials that represent learning that is shorter than typical degrees/certificates (usually representing work from one semester or less). In short, these credentials are different because they are

- data rich, embedding actual evidence of the learning permanently into the credential;
- based on open technology standards, allowing the credentials to be shared and exported/imported into different systems;
- micro, representing learning that is smaller than a degree or certificate program;
- flexible, representing learning from both formal (e.g., classes) and informal (e.g., self-learning, workshops) situations.

Despite these innovative new technologies, much of the discourse around these credentials has been uninspiring, as it has focused on how to use new tools to reinvent old systems. For example, it is popular to issue microcredentials for completed courses—which continues to only recognize learning as "valid" if completed at a university. New thinking is needed to consider how to use these Internet technologies to more fully democratize education in society, recognizing learning from inside *and* outside formal schools and painting more complete and equitable pictures of everything a student has learned.

In this paper, I first review the important role that credentials play in society, and I review some of these technological innovations that have emerged in this space in the past decade. I then discuss what research has found about the early implementations of these technologies and propose a framework to guide future research and practice. In discussing all of this, I rely on a 3M (West and Cheng, 2022; adapted from Zawacki-Richter, 2009) model of how educational credential systems interface at micro (learner/personal), meso (institutional), and macro (societal) levels. I also focus most of my discussion on higher education, where the bulk of work in this area has been accomplished to this point.

The Important Role of Credentials in Society

Educational institutions exist in society to meet various important needs, including preparing capable workers for society, resolving inequities, unifying a diverse population, preparing educated citizens who can more fully engage in our democracy, and helping individuals achieve their potential for self-actualization and fulfillment (see Feinberg and Soltis, 2004; Kober, 2007). In addition, schools exist for the blunt reason of producing degrees and other certifications, what Gallagher (2016) called "the foundation of the business model for most higher education institutions" (p. 3). In creating these credentials, schools meet a critical communication need by signaling to society about a particular student—sharing insight into not only what courses the student completed but also the student's potential for various roles in society. In this way, not only do they communicate to employers and other gatekeepers in society what a learner knows, but these credentials also serve as "useful indicators of other productivity characteristics and proxies for ability and potential" (Gallagher, p. 38).

Besides signaling to employers about learners, there are two additional groups that educational credentials communicate to. First, they communicate to educators what kinds of teaching they should do. For example, if the credential represents an accumulation of knowledge, then instructors will likely teach through lecture as an efficient method of delivering information (Taglieri et al., 2017). If the credential represents the acquisition of skill, then using experiential learning strategies will more effectively develop these skills (Franco Valdez and Valdez Cervantes, 2018). Meanwhile, if the credential represents social skills, team-based learning and collaborative learning approaches will be used (Haberyan, 2007).

In addition, if the credential is designed based on an industrial model of sorting students into those who have "it" and those who do not, then this design communicates to teachers that their teaching should be a form of sorting. This leads teaching to become less focused on growth and equity and more focused on comparisons, creating controversial practices like "curved" grading, which forces a certain percentage of students to be labeled failures (with a capital *F*) without regard to what kind of growth they may have experienced. It also discourages mastery grading or a "growth mindset" (Dweck, 2016) and relies instead on one-snapshot-in-time assessment. Finally, it creates artificial deadlines for learning, requiring students to learn within a set schedule, regardless of their personal situations or motivations. This disadvantages not only students who need more time to learn but also those who need less. Either way, students fall out of the "flow" of learning (Csikszentmihalyi, 1990) where learning is enjoyable and see learning instead as a chore.

In addition to communicating to employers and teachers, credentials also communicate to students about what they know, what matters, and who they are. In the previous example, traditional

approaches to grading communicate to students whether they are "gifted," "average," or "struggling." These perceptions powerfully affect them. For example, Crocker et al. (2003) found that on days when students receive a bad grade, their sense of identification with their major declines. In short, the credential communicates to them that they do not belong in that community or discipline.

In summary, credentials are critical to how educational institutions interface and support society. They communicate to employers and others about the potential of a person, but they also communicate to teachers and institutions about how they should "do" education. Finally, they communicate to learners themselves about how they should think about themselves and about the educational experiences they have had. For these reasons, credentials are core to educational reform and even societal reform; as Gallagher (2016) explained, "Evolving the credential ecosystem is key to optimizing higher education" (p. 20).

Reconsidering Credentials: The Rise of Alternative, Micro/Nano, and Open Credentials

Recently, digital technologies have created space for us to rethink what kinds of credentials we want in society and schools. Many alternative credentials have emerged that are very different from the traditional degree or diploma. First, these alternative credentials can represent smaller pieces of learning and thus communicate where in a process a student may be in their development. For example, microcredentials are educational credentials representing less learning than a degree or certificate—often representing a single competency or piece of knowledge. They can be paper credentials, but most often they are discussed as digital credentials that are machine readable and information rich, contain evidence of the learner's activity, and are easily transferable between different learning systems (for examples, see Clements et al., 2020). Besides being awarded for single skills or experiences, they can also be awarded to acknowledge engagement within learning or work communities, development of soft/professional skills, or recognition by others of someone's abilities or performances.

The innovation provided by digital technologies is that these microcredentials can be packed with endless amounts of data about the expectations for the learner, their performance against those expectations, and how they were evaluated (and when/how). In this way, they often serve much like validated letters of recommendation, with an accompanying narrative about how the person performed and their relationship to the reviewer, but with the added benefit of actual data to support the recommendation.

Digital technologies provide an added benefit when these credentials can be created using open infrastructures such as the Open Badges (https://openbadges.org/), Verifiable Credentials (https://www.w3.org/TR/vc-data-model/), and Comprehensive Learner Records (http://www.imsglobal.org/about/clr) standards. Utilizing these open standards enables credentials to be shared between institutions, breaking down needless barriers that lock learning to a particular institution. With open credentials, the learner can own the data about their learning achievements and combine achievements from school, work, community, and online sources to paint a more accurate picture of who they are and what they have accomplished. In this way, open, digital credentials allow us to recognize *all* of what people learn instead of just what they learned inside a university classroom for one hour a class, three days a week during a 15-week artificial block of time.

In addition, because these microcredentials are digital and open, they can be tracked and used to create a digital trail—even as they are exported/imported into different systems. Currently, open technology standards such as the Open Badges standard and Comprehensive Learner Records standard allow many third-party tools to be created to issue these credentials. Each credential is embedded with data about who issued the credential, based on what evidence, and to whom. In addition, these credentials can be tagged with national standards, particularly if using the open technology standard called Competency and Academic Standards Exchange (https://www.imsglobal.org/activity/case).

In the end, this means that any organization can make a claim that a learner has met a particular standard and acquired a certain competency and can issue a credential with all of this evidence; and employers or future institutions can then identify and recruit these persons by searching for specific competencies in online databases. If there is doubt about the validity of a particular microcredential, the microcredential can be verified using tools such as https://badgecheck.io/. In addition, because the evidence is all embedded in the microcredential, there is complete transparency so that someone else could view the evidence and the criteria for the credential and could make their own judgment about whether it was properly issued. That level of transparency does not exist in the current system of grades and degrees, where how a student was graded, and against what criteria, is often hidden and unavailable without directly contacting the professor.

Currently, there is quite a bit of confusion about what to call these kinds of credentials, as they are referred to by different names, such as microcredentials, Open Badges, Verifiable Credentials, stackable credentials, and blockcerts (West and Cheng, 2022). Ultimately, these various credentials use the same, or similar, underlying technologies, and they can accomplish similar purposes, adding to the confusion. The first step to more effectively integrating these credentials into society is to develop agreed-upon terminology. In this paper, I adapt the credential-ecology framework from Brown and Mhichil (2021) to use the terms "macrocredentials" for formal degrees, "microcredentials" for formal micro/stackable, but still accredited, credentials, and "nanocredentials" or "badges" to represent informal and nonformal recognitions of learning and activity.

How Effective Are Alternative, Open, and Micro- (Badge) Credentials?

Our understanding remains limited as to how effective these various credentials are for supporting student learning, communicating learner ability, and supporting the vital roles of education within society. This limitation is largely because these credentials are still a recent innovation and also because full integration into educational systems is difficult, as it requires changing teaching strategies, data-management systems, and learner expectations.

Still, research has identified a few key findings (see West and Cheng, 2022 for a full review). For example, it appears that open micro/nanocredentials are helpful for motivating students, but often more for extrinsically motivated students than intrinsically motivated ones. They also can support improved learning when paired with appropriate pedagogies (such as personalized learning) or as part of encouraging student self-regulation of learning. For example, learners in a college chemical-laboratory course (N=559) mentioned that digital badges allowed them to receive personalized feedback. In this case, via the Passport badging platform developed by Purdue University, graders

and teaching assistants wrote personalized feedback to students after the latter had submitted their work, and students could resubmit their work multiple times after incorporating feedback (Santos-Díaz et al., 2019).

However, despite these benefits, many challenges remain in integrating micro/nanocredentials into education, including how institutions should incorporate these alternative and open credentials into their digital/data systems, what the credentials should represent to groups within society, and how to develop rigor and trust in the credentials.

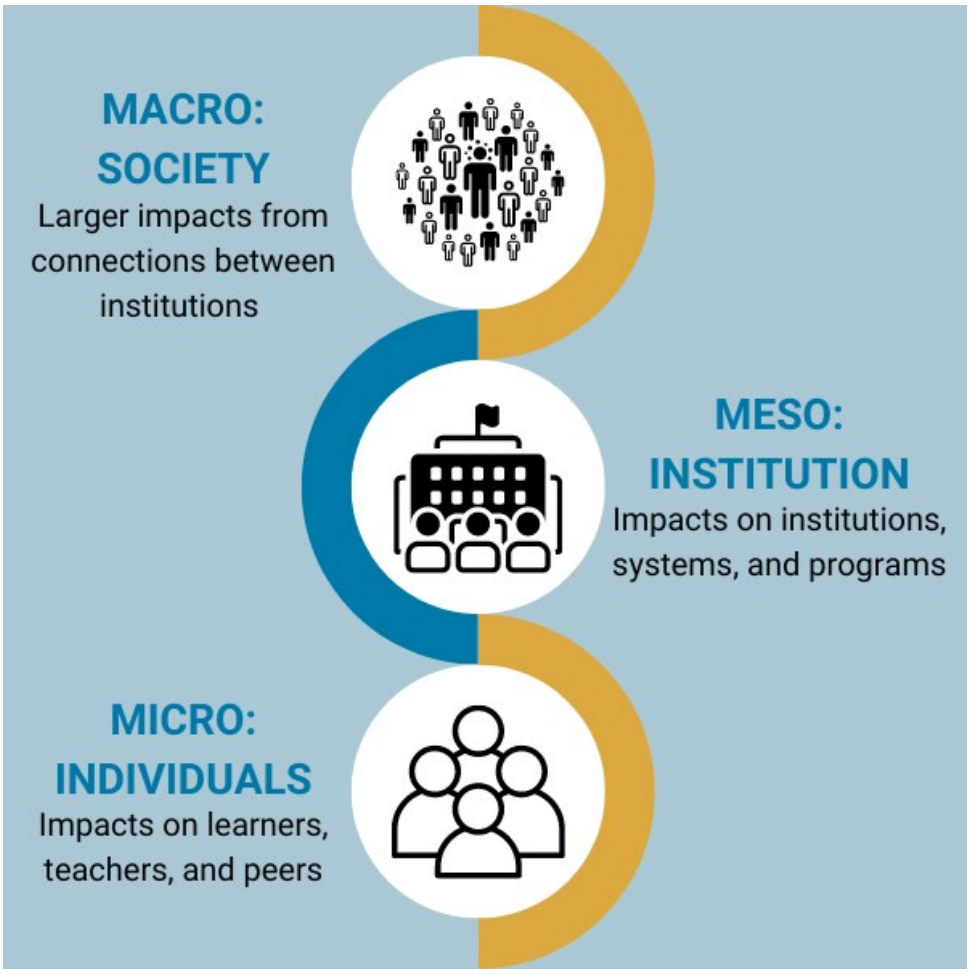
Despite these challenges, we do know that the usage of these credentials is growing rapidly. For example, it was estimated that from 2011 to 2018 between 15 and 24 million Open Badges had been issued (IMS Global, 2022; Mozilla, 2018), a number that grew to 43 million by 2020 (Abel and Surman, 2021). IBM, a leading organization in the early adoption of Open Badges, reported in 2019 that the number of badges it issued that year alone was double how many it had issued in all previous years (beginning in 2015; see Leaser, 2019).

This growth has led some organizations to believe that education and learning have been irrevocably disrupted. For example, the Education Design Lab, an early innovator in this space, reported that "within the decade, all but the most exclusive learning providers, old and new, will compete for students at the competency and experience level rather than at the degree level. That is the principal paradigm shift of the Learner Revolution" (deLaski and Lifland, 2020). Others see this change as more complementary than revolutionary. As Gallagher (2019) argued, "Rather than sweeping away degrees, new types of online credentials—various certificates, MicroMasters, badges, and the like—are instead playing a complementary role, creating the building blocks for newer, more affordable degree programs" (para. 9). Regardless, this predicts a new role for credentials in 21st-century society, as we will transition to requiring greater transparency, better data on actual learning, and stronger communication of who learners and employees are and what they are capable of doing.

Integrating Micro/Nanocredentials at the Micro, Meso, and Macro Levels of Society

In order for these new, alternative credentials to achieve their potential, we need to rethink educational policy, systems, and strategies to better incorporate micro/nanocredentials. A useful framework for considering these systemic changes is the 3M model (West and Cheng, 2022, modified from Zawacki-Richter, 2009). In this model, shown in Figure 1, the authors propose considering educational innovations and their interface with society at the *micro* level, or at the level of individual students and faculty; at the *meso* level, where institutions such as universities and colleges reside; and at the *macro* level, which is the societal level.

Figure 1. 3M Model for Considering the Impacts of Open Credentials within Three Levels of Society



This model is a useful tool for considering the role of micro/nanocredentials because credentials communicate meaning to all three levels. At the individual level, credentials communicate what a teacher believes about a student's ability or performance and certify what the teacher knows from direct experience about that learner. A credential also carries meaning to the learner about what they know about their own abilities, which affects their self-efficacy within a given domain and guides their choices about future learning, career, or life opportunities.

At the meso (organizational) level, credentials provide information about what a person is able to do and what support they should be given. For example, credentials (or at least grades as a form of learner recognition) verify whether a student should be allowed to register for higher-level courses, receive financial aid, represent the university in competitions and athletics, or qualify for other university opportunities.

Micro/nanocredentials can also be useful in tracking student progress, as these credentials are more bite-sized than a full degree, and they could also be useful in keeping alumni connected by offering lifelong professional-learning opportunities. In addition, implementing these data-rich and digital credentials can help institutions stay current on market trends by tracking how students with

various credentials are employed, feeding back valuable information about necessary skills in the marketplace at a more refined level than degrees can provide. Finally, organizations need credentials to certify confidence that a learner has met the requirements of that institution. These credentials carry the good name and faith of the institution, and institutions rise and fall based on their organizational credibility.

Credentials also serve as a form of advertisement for the organization, communicating to society as much about the institution as they do about the learners themselves. For example, in one research study, Young et al. (2020) studied the impact of implementing microcredentials within National Instruments to scaffold user training and knowledge of its products. While learners felt the system helped them learn engineering technologies and skills, the company saw great benefit from the credentials' being shared on social media—providing free brand impressions for the company. As Gallagher (2016) commented, credentials carry a "power of reputation," and "institutional reputation is a driving focus of many higher education institutions—particularly in an era when global university rankings are creating worldwide competition for prestige" (Gallagher, 2016, p. 61). Micro/nanocredentials can play a key role in driving this institutional reputation, if implemented well.

At the macro (societal) level, credentials meet different purposes. Credentials from one organization (like a school) need to be quickly understandable to people in other organizations (e.g., human-resource professionals involved in hiring and promotion decisions). If they are, micro/nanocredentials could have the potential to democratize learning and unleash it from the current model, where only learning at one institution (e.g., a university meeting some standard of quality) "counts" while other forms of learning do not. This system creates a loss of learning data about individuals, as much of what people learn and the experiences they have had are not communicated with current credentials such as degrees. Thus, data systems need to be widely implemented that collect all the data about an individual and allow the individual to share as much, or as little, of that data in various places.

These open, comprehensive data systems can potentially disintegrate the artificial barriers between work-based learning, school-based learning, and other forms of lifelong learning, such as community-based learning. For example, Artevelde University College created the Gentlestudent project to connect 74,000 students in Ghent with the local community, residents, and organizations in the city via the use of microcredentials. In this community-based project, students could earn five generic badges on digital literacy, sustainability, global citizenship, entrepreneurship, and research skills connected to the needs of residents in Ghent. It is important to note that due to the COVID pandemic, this project was closed down soon after launching and thus we do not have data on its actual implementation, though we can discuss the concept of community-based learning that it represented.

Conceptually, through Gentlestudent, learners could work on badges through not only school curricula but also informal learning in the city where they lived and studied. This community-based learning could be mutually beneficial: students receive mentoring and authentic, experiential learning opportunities while organizations/businesses get access to student skills and talents. In this way, Ghent would not only serve as an important *living environment* but also be considered a dynamic *learning center* for residents to learn in (Vanacker, 2018). The city and its residents would reciprocally nourish each other. This kind of system, especially if sponsored by universities, may best represent the merging of the 3 *C*'s of education: content, community, and credentials.

Next Steps: Improving the Implementation of Micro/Nanocredentials

Improving Implementation at Micro Levels

At the most micro level of learning is the dyad of instructor and student. To improve implementation at this level, we need continued development of usable technologies to issue and receive micro/nanocredentials, greater training about what they are and what they represent, and scaffolding for users. First, while open data standards provide the promise of easily transferring credentials from one system to another, the process is still not as simple as it needs to be for mass adoption. Learners need simple systems that track their performance across systems and automatically collect their credentials. For example, data synchronization currently is robust in the area of web advertising. A user's search patterns across devices and platforms can be managed and synced, creating a single profile of the user and generating recommendations for new products. This creates the interesting experience of browsing for one thing on your phone and then finding advertisements for similar products later on your computer or television. This happens often seamlessly, without the user being aware.

What if the process were similar for data that the user *wants* to be collected, retained, and organized—for example, if your learning in one app, your reading on your Kindle, and your performance in a class, added to your participation in a workshop, could create a single profile of all you could do and be in that area? One potential use case could be in language learning, where learners could enroll in a class at the university or in the community for university credit, participate in an app such as Duolingo and earn badges, listen to a podcast in the language (and potentially earn another badge), and even participate in an event in that target language, such as a cultural festival or cultural dance class, and earn still more badges based on those activities.

Then these activities could all be automatically collected and made available to the learner in one profile about their language proficiency. The learner could then be prompted to review the data and accept/reject various pieces of data to refine the profile and better communicate their true behavior and ability. While employers and other institutions may wish to have this control themselves, because of data-privacy concerns it would be critical that the learner retain ownership over these data and control what is collected about them and whether the data become visible in their profile.

After granting learners this control over their data, these technologies could make collecting data about our potential as learners as seamless as collecting data about our potential as consumers, and this could assist individuals in showcasing their full knowledge and skills. However, as part of this, 21st-century learners need support in understanding that *they* own their data and narrative and must *craft their professional story* to share online with others. This scaffolding would teach learners what data are important to showcase and how to organize them into a useful narrative about themselves. In a world that is awash in data, knowing *how* to tell their story is a key 21st-century skill.

Finally, we need to also support teachers and credential issuers in knowing how to teach with micro/nanocredentials through training and also openness to their own innovative ideas. Because breaking learning down into micro skills opens up possibilities for learning that is much more flexible, asynchronous, disaggregated, and competency-based, this may require universities to

relinquish some control over the teaching at their institution to allow for the flexible nature of microcredentials. We will not see the benefit, however, until teachers have developed skills in teaching strategies to match these credentials, including how to maintain the experiential and social nature of learning in this process.

In summary, recommendations for improving microcredential implementation at the micro level could include the following:

- Create simple systems for collecting learners' data across their varied learning experiences.
- Establish laws and safety systems for ensuring learners control their own data and when the data are used as part of their learner profile.
- Teach learners how to use their data to craft their own professional profile and learning story.
- Support teachers in redesigning education to utilize these microcredentials.

Improving Implementation at Meso Levels

Many articles have been published describing case studies of how various organizations developed their micro/nanocredentialing systems and describing the lessons learned. Gamrat and Bixler (2019) articulated four internal challenges that meso systems often face in developing open-badging systems: (a) first, the wide variety in how badges are designed; (b) the need for good assessment for open badges, and the reality that open badges are often trying to assess things that traditionally are difficult to evaluate (e.g., soft/career skills); (c) the complexity in designing badging systems visually and internally; and (d) the challenge of communicating the value proposition of the badges to others.

Addressing the first challenge is tricky, as school systems are typically designed to be very standardized. This has led to criticisms that campus micro/nanocredentials are overly standardized as well and represent a misunderstanding of micro/nanocredentials as tools for capturing a wide variety of experiences and learning. In addition, often the most meaningful learning experiences were not predicted ahead of time and could not have been predesigned. However, they are still meaningful and should be represented in a learner's profile and verified by those who witnessed them (e.g., an instructor, supervisor, peer).

If we are not careful, the effort to formalize all micro/nanocredentials could lead to a reification and replication of current educational processes—for example, replicating course grades as microcredentials, and minors as certificates—instead of allowing for true innovation where micro/nanocredentials could capture unexpected, but still meaningful, learning.

More thinking and research are needed in this area to solve this puzzle, but one potential solution may be for educational institutions to create systems for validated/predesigned credentials as well as systems for unplanned/unvalidated/informal credentials. For example, a university may decide to create university credentials that match their university's mission, perhaps in areas such as service learning, multicultural awareness, citizenship, leadership, and collaboration. Simultaneously they could enable teachers, supervisors, and perhaps even peers to create university-branded (similar to official letterhead) *community* badges that act as signed, data-rich testimonials of what a person has been able to do. These could be created immediately, as needed, and issued on a case-by-case

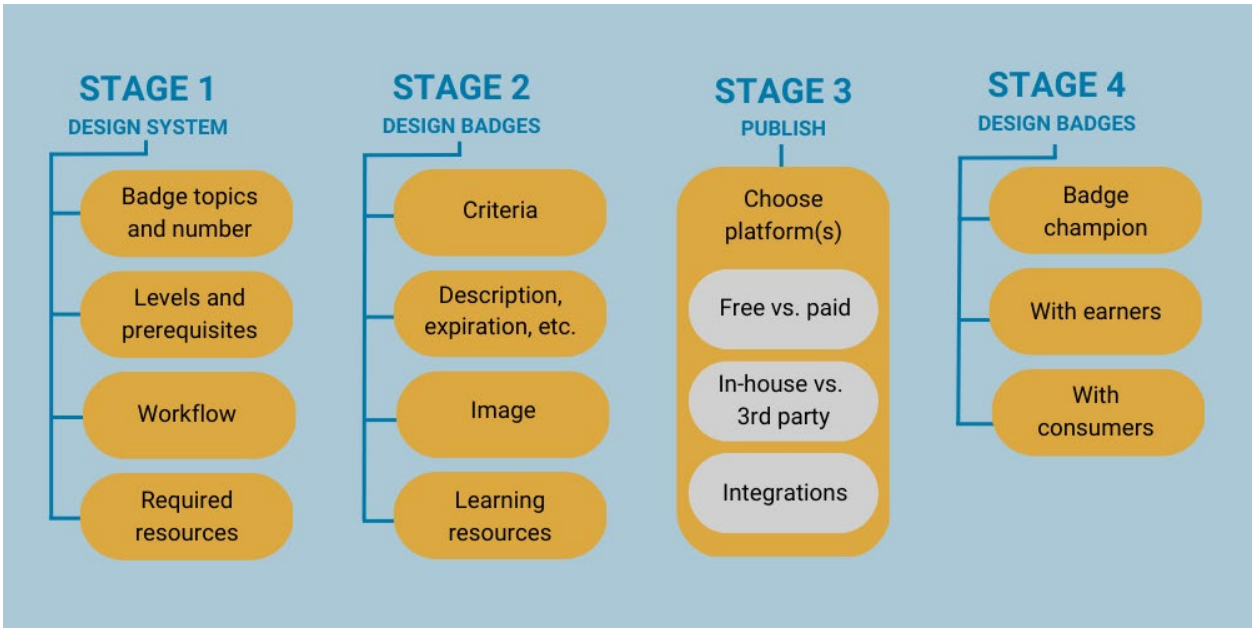
basis or even "asserted" by the learner themself before being validated by someone else. This kind of model would enable instructors to creatively develop new strategies for implementing micro/nanocredentials into their teaching.

One challenge that would still exist is that many potential credential issuers do not understand how to create effective assessments or criteria for learner recognition. However, some research indicates that the process for creating credentials and accompanying assessments can be effectively scaffolded by the institution. In one example, Randall et al. (2019) studied whether undergraduate students could be trained to create effective, rubric-based badge credentials. After being provided examples of already-designed rubrics, a small amount of training, and the opportunity for supervisor review, the students created many new badges/rubrics that were implemented in the course. These rubrics were then assessed by outside experts and found to be as good as the rubrics created by the original instructors.

Finally, some instructional-design researchers have articulated processes to guide organizations in creating micro/nanocredentials. Stefaniak and Carey (2019) studied digital-badge programs at three different higher education institutions, and in addition to exploring their adoption patterns and successes, they developed a framework for successful badge-program implementation that provided insights into how to design the badges, how to choose/implement the platform, and how to implement the program once designed.

Also, Clements et al. (2020) wrote a referendum on how to "get started with open badges and open microcredentials" where they provide examples of various types of badges and badging systems, defined the sometimes-tricky and sometimes-technical vocabulary of open-badging systems, and articulated a process that new designers can use where you first design the system, then design the badges, then publish and implement the system, and finally work on marketing and communicating value (see Figure 2).

Figure 2. Suggested Design Process for Designing Open-Badging Systems



Source: Clements et al. (2020)

Finally, Rossiter et al. (2019) created a design guide for practitioners, where they argued an institution should first design the ecosystem (focusing on the why, the who, and the how), then describe what the success criteria will be and the taxonomy representing the relationships between the credentials, then design individual learning modules/courses, and finally design the technology and issuing model that will be used to implement the system.

In summary, recommendations for improving microcredential implementation at the micro level could include the following:

- Create systems for validated/predesigned credentials as well as systems for unplanned/unvalidated/informal credentials, allowing for both types and communicating clearly to others which credentials were authorized by the university.
- Create university-branded *community* badges that act as signed, data-rich testimonials by someone of what a person has been able to do, but without the need to be fully validated by the university.
- Develop assessments, rubrics, and guides within a university to help instructors and other credential issuers.
- Follow processes articulated in the research literature for successful practice.
- Create design guides for practitioners that address why, who, and how to implement microcredentials effectively.

Improving Implementation at Macro Levels

Despite examples of many effective micro/nanocredential programs, projects, and courses, it remains a challenge to adopt this technology on a large-enough scale to transform educational systems within society. According to a review of 30 badge ecosystems, three competency-based digital-badge systems that received large funds from the Gates Foundation's Project Mastery initiative all encountered technology, validity, and personnel challenges, resulting in two systems being suspended after pilot implementations and one being never implemented. None of the other competency-based systems thrived in the long-term (Hickey and Chartrand, 2020). Restricted financial support remains another challenge. Scholarships and financial aid are mostly only available for formal education programs. Learners have limited opportunities to apply for financial support to earn nontraditional credits in informal learning contexts.

To overcome these challenges, future endeavors need to

- expand the value and meaning of badges outside their original context (Pitt et al., 2019);
- align micro/nanocredentials with competency-based assessment (Haughton and Sign, 2019);
- provide guidelines for what types of experiences should be credited with credentials and how to design different credentials (Tzou and Horstman, 2015);
- establish frameworks for at least developing a shared understanding of micro/nanocredentials (Stefaniak and Carey, 2019);

- develop standards to account for privacy concerns that remain a challenge when developing an open credential ecosystem (Reynolds, 2021); and
- mediate discussions on where and how metadata associated with these credentials should be created, stored, and shared.

A Proposed Research Agenda for Open Micro/Nanocredentials

It is clear that open micro/nanocredentials have been effective in accomplishing some outcomes at the micro and meso levels, with other instances of challenges, unresolved issues, and mixed results. In addition, it is still uncertain how to integrate the concept of open micro/nanocredentials within macro systems. This presents many opportunities for researchers to further study the potential of these open-credentialing technologies and their effects on learners, teachers, institutions, and systems.

In reviewing the research, as an example, there are several gaps. First, there is a need for more research at each of the 3M levels: micro, meso, and macro. In their review of the current literature, West and Cheng (2022) reviewed the research published in the past decade at each of the 3M levels. They concluded that we still know little about the potential and pitfalls of open credentials. Instead, most of the literature reports personal reflections on use cases instead of actual research into effectiveness. Much of the research that does exist is on professional development, particularly for primary and secondary teachers. In addition, a great deal of research focuses on applying microcredentials as part of a transition to a skills-economy mindset, with credentials recognizing discrete skills that are often technical in nature. Fewer research studies have investigated the applicability of open micro/nanocredentials in other domains. As an example, open credentials have the potential to recognize personal factors beyond just acquired skills—including interests, behaviors, self-directed learning, and the cascading of learning experiences that emerge from explorative learning. However, few studies exist on the challenges and benefits, or even the implementation, of this potential.

Because of the integrated and systemic nature of open microcredentials and how they affect the entire learning organization, I propose that researchers consider the following as a potential *beginning* framework for exploring research opportunities. Some of these questions are similar to those reported by Albert and Crawford (2021) in their report on the status of non-degree-credential research. Where they have additional questions, I integrate them into the 3M framework for clarity. There are undoubtedly more questions and categories that could be proposed within the micro/meso/macro framework that would also be helpful.

Table 1. A Proposed Framework for Research into Open Micro/Nanocredentials

Level of research	Research category	Potential research questions
Micro	Credential earners	1. What motivates credential earners? 2. Why are so many of these different credentials emerging? What is the unmet need? 3. Can open credentials motivate learning? 4. What kinds of credentials are motivating? 5. What kinds of endorsements and signals do earners desire in these credentials? 6. How can we integrate open credentials into the social lives of earners? 7. Why do earners choose to earn an open credential? Why do some choose not to? 8. How does earning an open credential affect employment and future life options? 9. Can open credentials encourage informal learning? 10. Does earning an open credential provide any psychological effects, such as learning self-efficacy? 11. How do learners choose between different open credentials? 12. Who starts, and who finishes, an open credential? 13. What other benefits do earners receive, including nonwage benefits?
Micro	Teachers	1. How do open credentials affect the role of teachers? 2. How can incorporating open credentials affect teacher pedagogical change/reframing? 3. How can teachers manage the workload associated with open credentials?

Level of research	Research category	Potential research questions
Meso	Credential designers	1. What are the most important features of an open credential? 2. What designs best communicate the open credential? 3. What are the interests/concerns of various stakeholders? 4. What opportunities does incorporating open credentials provide for rethinking educational systems? 5. How can open credentials create opportunities for developing career skills not typically taught in education? 6. How can we make open-credential implementations sustainable?
Meso	Credential evaluators	7. How should we evaluate work submitted for an open credential? 8. How can we develop capacity for assessing open credentials? 9. How can we make open-credential assessment more authentic?
Meso	Credential issuers	1. Are there benefits to institutions from offering open credentials (e.g., marketing, positive perception, learner retention, recruitment)? 2. What challenges might exist when an institution transitions to open credentials, and what strategies help to overcome these challenges?

Level of research	Research category	Potential research questions
Macro	Credential consumers	1. Who benefits from open credentials in society? Are these persons different from, or the same as, those benefiting from traditional credentials? 2. Can open credentials bridge the gap from education to the workforce? 3. Can open credentials support lifelong learning, and what benefits/challenges does this provide to society? 4. How can open credentials support partnerships among various stakeholders within society? 5. How can we improve the signals that open credentials communicate about learners, institutions, and so on? 6. How can we better connect the data from open credentials and nondegrees to larger market databases? What positive/negative effects does this have? 7. How can we reestablish trust in society about individuals and their capabilities? 8. How can we differentiate between high- and low-quality credentials? 9. How can we restore ownership of learning to learners themselves through open credentials? 10. How do different credentialing initiatives around the world compare, and what are best practices globally?

Conclusion

Micro/nanocredentials have the potential to be a major disruptive innovation in education, particularly because public confidence in traditional educational credentials is waning. Levine and Van Pelt (2021) reported that only half of Americans now consider a college degree to be important and 60% believe graduates lack specific job skills. Meanwhile micro/nanocredentials are growing in popularity. For example, over 30 million people are now registered on edX for microdegree programs (Marcus, 2020), 43 million Open Badges were issued as of 2020 (see https://openbadges.org/), and an increasing number of universities are developing their own microcredentials (including 88% of universities in an Australian sample, according to McGreal and Olcott Jr., 2022).

These are challenges that micro/nanocredentials are well positioned to address. First, these credentials can be earned inside colleges/universities but also in other organizations, allowing for more people to learn, grow, and earn credentials whether they choose to attend a university or not. Second, micro/nanocredentials are uniquely positioned to report on specific skill/abilities precisely because they can be issued at the competency, rather than the course, level. Finally,

micro/nanocredentials can recognize a variety of skills often forgotten in traditional education, such as social/soft/career skills. As Oblinger (2016) noted, "As the world has changed around us, our notions of what it means to be educated have evolved as well. Intellectual skills are a must in today's world, but so too are interpersonal skills" (p. viii).

However, potential does not equal outcomes, especially in education. The history of education is fraught with failed innovations that never disrupted learning institutions as promised. One reason why this happens is that new ideas, strategies, and technologies are not considered at all three of the 3M levels of implementation. Without designing effective strategies for individual teachers and learners, it is unlikely that an innovation will be successful. But similarly, failure to reform the educational institutions and the interfaces with society at large will similarly cause an innovation to fail.

References

Abel, R., & Surman, M (2021, March 3). Reflecting on the Open Badges journey. *IMS Global Learning Consortium.* Available at http://www.imsglobal.org/article/reflecting-open-badges-journey.

Albert, K., & Crawford, S. (2021). *New directions for non-degree credentialing research: Report of the Non-Degree Credentials Research Network*.

Borup, J., Graham, C. R., West, R. E., Archambault, L., & Spring, K. J. (2020). Academic communities of engagement: An expansive lens for examining support structures in blended and online learning. *Educational Technology Research and Development, 68*(2), 807–832.

Brown, J. S., & Duguid, P. (1996). Universities in the digital age. *Change: The Magazine of Higher Learning, 28*(4): 11–19. https://doi.org/10.1080/00091383.1996.9937757

Brown, M., Mhichil, M. N. G., Beirne, E., & Mac Lochlainn, C. (2021). The global micro-credential landscape: Charting a new credential ecology for lifelong learning. *Journal of Learning for Development, 8*(2), 228–254.

Christensen, C. M., & Horn, M. B. (2013, November 1). Innovation imperative: Change everything. *New York Times.* Available at https://www.nytimes.com/2013/11/03/education/edlife/online-education-as-an-agent-of-transformation.html

Christensen, C. M., Horn, M. B., Caldera, L., & Soares, L. (2011, February). *Disrupting college: How disruptive innovation can deliver quality and affordability to postsecondary education*. Innosight Institute.

Clements, K., West, R. E., & Hunsaker, E. (2020). Getting started with open badges and open microcredentials. *The International Review of Research in Open and Distributed Learning, 21*(1), 154–172.

Crocker, J., Karpinski, A., Quinn, D. M., & Chase, S. K. (2003). When grades determine self-worth: Consequences of contingent self-worth for male and female engineering and psychology majors. *Journal of Personality and Social Psychology*, *85*(3), 507.

Csikszentmihalyi, M. (1990). *Flow: The psychology of optimal experience*. Harper & Row.

deLaski, K., & Lifland, T (2020, January 2). *Six "College Hacking" Trends to Watch in 2020.* Education Design Lab. https://eddesignlab.org/news-events/six-college-hacking-trends-to-watch-in-2020/

Dweck, C. (2016). What having a "growth mindset" actually means. *Harvard Business Review, 13*, 213–226.

Feinberg, W., & Soltis, J. F. (2004). *School and society.* Teachers College Press.

Franco Valdez, A. D., & Valdez Cervantes, A. (2018). Retailing laboratory: Delivering skills through experiential learning. *Journal of Marketing Education*, *40*(1), 17–30.

Gallagher, S. R. (2016). *The future of university credentials: New developments at the intersection of higher education and hiring*. Harvard Education Press.

Gallagher, S. R. (2020, September 20). How the value of educational credentials is and isn't changing. *Harvard Business Review*. https://hbr.org/2019/09 how-the-value-of-educational-credentials-is-and-isnt-changing

Haberyan, A. (2007). Team-based learning in an industrial/organizational psychology course. *North American Journal of Psychology*, *9*(1), 143–152.

IMS Global (2022). *Open Badges history*. https://openbadges.org/about/history

Kober, N. (2007). *Why we still need public schools: Public education for the common good*. Center on Education Policy (ED503799). Available at ERIC: https://files.eric.ed.gov/fulltext/ED503799.pdf

Leaser, D. (2019, June 18). Do digital badges really provide value to businesses? https://www.ibm.com/blogs/ibm-training/do-digital-badges-really-provide-value-to-businesses/

Levine, A., & Van Pelt, S. (2021, September 13). Opinion: Meet certificates and "microcredentials"—they could be the future of higher education. *The Hechinger Report*. https://hechingerreport.org/opinion-meet-certificates-and-microcredentials-they-could-be-the-future-of-higher-education/

Marcus, J. (2020). Urgency of getting people back to work gives new momentum to "microcredentials." *The Hechinger Report*. Available at https://hechingerreport.org/more-students-start-earning-stackable-credentials-on-their-way-to-degrees/

McGreal, R., & Olcott, D. (2022). A strategic reset: Micro-credentials for higher education leaders. *Smart Learning Environments*, *9*(1), 1–23.

Mozilla. (2018, August 15). An update on badges and backpack. https://medium.com/read-write-participate/an-update-on-badges-and-backpack-5a06fab252ea

Oblinger, D. G. (2016). Foreword. In S. Gallagher, *The future of university credentials*. Harvard Educational Press.

Randall, D. L., Farmer, T., & West, R. E. (2019). Effectiveness of undergraduate instructional design assistants in scaling a teacher education open badge system. *Contemporary Issues in Technology and Teacher Education, 19*(4), 825–849.

Rossiter, D., & Tynan, B. (2019). Designing and implementing micro-credentials: A guide for practitioners. Commonwealth of Learning. http://oasis.col.org/.

Santos-Díaz, S., Hensiek, S., Owings, T., & Towns, M. H. (2019). Survey of undergraduate students' goals and achievement strategies for laboratory coursework. *Journal of Chemical Education, 96*(5), 850–856.

Smalley, S. (2021, October 13). Half of all college students take online courses. *InsideHigherEd*. Available at https://www.insidehighered.com/news/2021/10/13/new-us-data-show-jump-college-students-learning-online#.YvMi9IxxJzE.link

Stefaniak, J., & Carey, K. (2019). Instilling purpose and value in the implementation of digital badges in higher education. *International Journal of Educational Technology in Higher Education, 16*(1), 1–21.

Taglieri, C., Schnee, D., Camiel, L. D., Zaiken, K., Mistry, A., Nigro, S., . . . & Goldman, J. (2017). Comparison of long-term knowledge retention in lecture-based versus flipped team-based learning course delivery. *Currents in Pharmacy Teaching and Learning*, *9*(3), 391–397.

Wenger, E. (1999). *Communities of practice: Learning, meaning, and identity*. Cambridge University Press.

West, R. E., & Cheng, Z. (2022). Digital credential evolution: How open microcredentials/badges support learning in micro, meso, and macro levels. In O. Zawacki-Richter & I. Jung (Eds.), *Handbook of open, distance, and digital education*. Sage.

Young, D., West, R. E., & Nylin, T. A. (2019). Value of open microcredentials to earners and issuers: A case study of national instruments open badges. *International Review of Research in Open and Distributed Learning, 20*(5), 104–121.

Zawacki-Richter, O. (2009). Research areas in distance education: A Delphi study. *International Review of Research in Open and Distributed Learning*, *10*(3).