



Micro-Credentials and Badges in Education: a Historical Overview

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Today's employees are expected to cultivate knowledge using the internet, digital literacy skills, and networked learning (Itow et al., 2016; Rimland & Raish, 2019; Zimmerman, 2002). However, expertise development is often opaque to a novice who must navigate her own knowledge gaps. To address this issue, micro-credentials have emerged as an innovative approach to support self-directed learning that can make visible learners' efforts with digital badges (Bowen & Thomas, 2014; Farmer & West, 2017). In contrast to other informal learning methods, micro-credentials outline incremental learning pathways with badges and serves as visual representations of specific skills to be achieved along the way toward larger goals.

Although badges have historical roots as outward symbols of achievement and authority, their implementation into the education domains as 'micro-credentials' recasts them as a viable pedagogical tool (Ahn et al., 2014; Casilli & Hickey, 2016; Ellis et al., 2016; Halavais, 2012). With increased popularity, a theoretical framework is needed to establish micro-credentials in instructional design. A review of studies reveals a strong connection to self-regulated learning (SLR), with its focus on metacognitive strategies and cyclical learning phases to support lifelong learning, as a potential answer to this need (Cucchiara et al., 2014; Pintrich, 2005; Wills & Xie, 2016; Zimmerman, 2002).

Historical Roots of Badges and Micro-Credentials in Education

Micro-credentials approach learning through incremental, small-scale skill development. They offer an alternative to traditional credentialing like certificates, diplomas, and grades by recognizing discrete skill development via digital icons called badges, which are embedded with meta-data such as criteria for and evidence of achievement (Farmer & West, 2017; Randall et al., 2013). Merit badges from the Boy Scouts are the often-used metaphor for micro-credentials because each physical badge acts as a clear representation of a skill that a scout has mastered, such as wood carving or geocaching (Ellis et al., 2016; Halavais, 2012; Ostashewski & Reid, 2015). Badges have even deeper historical roots in the military and even religious pilgrimages in which they acted as outward symbols of achievement, authority, and belonging (Ellis et al., 2016; Halavais, 2012). Later, digital badges appeared in video games with the same goal of signaling achievement (Beattie, 2014; Ostashewski & Reid, 2015).

Micro-credentials emerged at the intersection of these historical and gamification applications, transforming to fit the needs of self-directed learners at all levels of education (Ahn et al., 2014; Halavais, 2012; Ostashewski & Reid, 2015). Halavais (2012) warned that the historical value of badges as extrinsic motivators cannot strictly carry over into education without adaptation; rather, they should evolve to intrinsically motivate learners by showcasing their continuous growth toward larger learning goals. In fact, early studies into micro-credentials have demonstrated that recipients of badges value the structured learning path more so than the ability to display their achievements (Diamond & Gonzalez, 2016; Dyjur & Lindstrom, 2017; Gamrat & Zimmerman, 2015; Jones et al., 2018). As interest in self-directed learning and alternative pathways of education emerged, the U.S. Department of Education Secretary, Arne Duncan, encouraged this view stating "badges empower students and teachers to play an even stronger role in their own learning and development - to seek

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out the right tools among many resources available [...] - and build a record of what they have mastered” (Duncan, 2011, para. 18). Micro-credentials in education are thus built on a tradition of badges, but are reimagined to fulfill the needs of a changing society.

Self-Regulated Learning as Micro-Credential Instructional Design

The growth of micro-credentialing and badges coincide with the need to better support self-regulated learning (SRL) abilities (Besser & Newby, 2019; Cheng et al., 2018; Cucchiara et al., 2014; Wills & Xie, 2016). Self-regulated learners are autonomous, active agents who “set goals for their learning and then attempt to monitor, regulate, and control their cognition, motivation, and behavior, guided and constrained by their goals” (Pintrich, 2005, p. 453). There are different models of SRL, but they generally consist of three phases that learners must traverse for meaningful learning: forethought (before learning), performance (during learning), and self-reflection (after learning) (Pintrich, 2005; Sun et al., 2018; Zimmerman, 2002). Learners can self-regulate at all stages of their lives, and micro-credentials can enhance their efforts by providing a tangible structure for each phase of the learning cycle.

There are various historical examples of micro-credentials rooted in principles of SRL. The forethought stage, for example, encourages learners to write down their personalized learning goals and then select the corresponding badges (Cheng et al., 2018; Gamrat et al., 2014; Randall et al., 2013; Wills and Xie, 2016). Additionally, researchers employed micro-credentials as a pre-emptive way for learners to string together badges to form milestones or waypoints along a path toward their ultimate goal (Ahn et al., 2014; Farmer & West, 2017; Fontichiaro & Elkordy, 2013; Itow et al., 2016; Randall et al., 2013). In doing so, the badges form an ecosystem that allow learners to visualize a path to professionalism before learning begins.

In the performance stage, self-regulated learners must be able to monitor and control their learning through necessary adjustments to their environment or strategies (Pintrich, 2005; Zimmerman, 2002). Such strategies include seeking help from more knowledgeable peers, among others. Historically, badge-seeking is a lone endeavor, but educational research into micro-credentials demonstrate that instructional design must also support collaborative and community building behaviors. Itow et al. (2016), in a study of 30 digital badge systems, found that designs which “highlighted collaborative skills over discrete skills and fostered peer-centered, networked learning” were more successful (p. 413). In another study involving a micro-credential-based program design for teachers, researchers found that participants desired a cohort

structure where they could benefit from peer modeling and collaboration (Gamrat & Zimmerman, 2015). Micro-credentials can support SRL by emphasizing and emulating the peer-networked learning that is needed for twenty-first century growth.

Finally, in the self-reflection stage, learners must evaluate their performance and use that information to make decisions about future learning (Pintrich, 2005; Zimmerman, 2002). Zimmerman (2002) stated, “students who have the capabilities to detect subtle progress in learning will increase their levels of self-satisfaction in their beliefs in their personal efficacy to perform at a high level of skills” (pp. 66–67). Micro-credential program design should allow learners to look back on a learning path made up of small skill acquisitions as (a) a reminder of how far they have come and (b) as a way to identify gaps for future learning, as was exemplified by teachers in studies by Gamrat et al. (2014) and Jones et al. (2018). Besser and Newby (2019), in their study of a badge-based program for pre-service teachers, similarly found badges are most impactful when they are accompanied with feedback from the professor. The instructional design of micro-credentials must, therefore, include careful consideration for feedback both at the individual badge level and over the entire learning journey.

Conclusion

As micro-credentials continue to proliferate educational research to support formative development, the need for standards and best practices in instructional design will become increasingly urgent. Initial studies connecting design to self-regulated learning indicate that its three phases create a sound theoretical framework for micro-credential program design. More research is needed to further refine the design process as guided by SRL and to study the impact of SRL-led program design on preparation for the 21st century workplace.

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