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Digital Badges and Micro-Credentials in Higher Education and Professional Development: A Narrative Review of Motivation, Perceived Value, and Implementation

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ABSTRACT

Higher education continues to face a persistent gap between academic outcomes and workforce demands, a problem intensified by the limited explanatory value of traditional transcripts. In response, digital badges and micro-credentials have emerged as tools for documenting verifiable competencies. However, the existing evidence base remains fragmented and methodologically constrained. To address this, this narrative review synthesizes recent empirical research on the integration, utility, and impact of digital credentials. A comprehensive search of EBSCOhost, PubMed, and Google Scholar was conducted, capturing literature published between 2017 and 2025. Following a structured screening protocol, 14 peer-reviewed empirical studies were selected and evaluated using a hybrid inductive and deductive thematic analysis. The synthesized findings demonstrate that well-designed badge systems extend beyond gamified incentives to function as sophisticated pedagogical tools supporting self-regulated learning and professional identity formation. Key results indicate a complex duality in learner motivation, where initial extrinsic engagement must transition into perceived intrinsic value for sustained persistence. Additionally, while stackable frameworks provide transparent alternatives to traditional grading, poorly integrated systems risk inducing cognitive overload and grade anxiety without active instructor mediation. Effective implementation requires balancing standardized labor market recognition with contextual flexibility through sustained collaboration between higher education institutions and industry stakeholders. The review concludes by highlighting the critical need for objective longitudinal and cross-cultural research to determine long-term pedagogical impacts and promote equitable educational outcomes.

Keywords: digital badges, micro-credentials, higher education, competency-based assessment, continuing professional development

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INTRODUCTION

The higher education sector is undergoing substantial transformation in response to shifting labor market expectations, rapid technological change, and evolving pedagogical models (Bobrytska et al., 2025; Bozkurt & Brown, 2022). Within this context, traditional academic transcripts have come under increasing scrutiny for their limited capacity to communicate the specific knowledge, skills, and competencies students acquire throughout their academic programs. Although transcripts remain the dominant form of academic recognition, they often provide only a narrow and reductionist account of student achievement, offering employers little meaningful evidence of graduates' demonstrable and work-relevant capabilities (Carey & Stefaniak, 2018; Goulding et al., 2024; Gregg et al., 2022). This limitation has intensified concerns regarding the persistent disconnect between higher education outcomes and workforce needs, thereby reinforcing interest in competency-based education and more personalized learning pathways that foreground verifiable skills and applied performance (Ahsan et al., 2023; Bobrytska et al., 2025; Bozkurt & Brown, 2022).

Against this backdrop, alternative credentialing approaches, particularly micro-credentials and digital badges, have gained increasing prominence. Micro-credentials are typically used to certify discrete, specialized, and measurable forms of learning that are not always adequately represented in traditional degree structures, while digital open badges provide portable and metadata-rich representations of such achievements that can be verified and shared across contexts (Ahsan et al., 2023; Carey & Stefaniak, 2018; Galindo & Fennelly-Atkinson, 2025). Importantly, these mechanisms are not only administrative tools for documenting learning outcomes. Emerging scholarship suggests that well-designed badge systems may also serve pedagogical functions by supporting learner progression, providing timely feedback, and fostering greater autonomy and agency in the learning process (Besser & Newby, 2020; Brauer & Siklander, 2017; Cheng et al., 2020; Goulding et al., 2024; Wills & Xie, 2016). As a result, digital badges and micro-credentials are increasingly positioned as instruments that may help bridge the divide between academic learning, assessment practices, and employability.

Existing literature has identified several promising contributions of digital badges across higher education and professional learning environments. Studies conducted in various disciplinary contexts indicate that badge-based systems may enhance learner motivation, strengthen self-efficacy, and support persistence (Gregg et al., 2022; Raj & Divya, 2024; Velázquez-García et al., 2024). In parallel, instructional design research has highlighted the potential of hierarchical and stackable badge structures to support competency-based assessment by emphasizing demonstrated mastery rather than simple participation or course completion (Carey & Stefaniak, 2018; Diamond & Gonzalez, 2014; Elkordy, 2016; Fedock et al., 2016; Watson et al., 2023; Väätäjä et al., 2024).

At the same time, micro-credentials have been recognized as flexible tools for capturing informal and non-formal learning, particularly in continuing professional development (CPD), where they can support lifelong learning among faculty, adult learners, and professionals managing complex work responsibilities (Donnelly & Maguire, 2020; Risquez et al., 2020).

Despite this growing interest, the evidence base remains fragmented and methodologically limited. Much of the current research relies on small-scale studies, relatively homogeneous and Western-centric samples, and self-reported perceptions rather than independently verified behavioral outcomes (Bobrytska et al., 2025; Galindo & Fennelly-Atkinson, 2025; Gregg et al., 2022). In addition, longitudinal evidence remains scarce, making it difficult to determine whether the reported benefits of badge-based systems reflect sustained pedagogical value or only short-term responses to novelty and gamification (Ahsan et al., 2023; Gibbons, 2019). Important conceptual concerns also remain insufficiently examined, including the extent to which badging systems may produce unintended consequences such as heightened performance anxiety, exclusionary competition through leaderboard structures, or inequitable learner experiences arising from insufficiently inclusive design (Goulding et al., 2024; Pelizzari & Ferrari, 2025). Taken together, these limitations

suggest that although digital badges and micro-credentials are widely promoted as innovative responses to contemporary educational demands, their pedagogical value and implementation challenges require more critical and integrated examination.

While existing systematic literature, such as the comprehensive review by Ahsan et al. (2023), has mapped key logistical and institutional barriers to implementing digital credentials, this macro-level focus leaves important pedagogical questions less fully resolved. By emphasizing technological readiness and broad stakeholder concerns up to 2021, prior syntheses provide limited insight into the psychological realities of learners, the assessment tensions produced by badge-based systems, and the post-2021 maturation of digital badging from experimental gamification features into more institutionalized assessment architectures. To address these gaps, the current review moves beyond logistical and administrative accounts by critically synthesizing recent multidisciplinary evidence on learner motivation, grade-related anxiety, labor market recognition, and flexible formative assessment. In doing so, it clarifies the pedagogical contingencies required for digital credentials to function as transformative educational instruments rather than merely symbolic or administrative markers of achievement.

This narrative literature review synthesizes and critically evaluates contemporary empirical evidence on the integration, utility, and impact of digital badges and micro-credentials in higher education and professional development. It examines their influence on learner motivation, engagement, and assessment, evaluates their role in CPD and workforce alignment, and analyzes the structural and pedagogical tensions that shape their implementation. It further identifies key methodological limitations in the existing literature to inform more rigorous future research. In doing so, the review offers an evidence-based foundation for the more effective and equitable design, adoption, and evaluation of digital credentialing practices.

THEORETICAL FRAMEWORK

To provide a robust foundation for examining the pedagogical utility of digital badges and micro-credentials, this review is anchored in a tripartite theoretical framework encompassing motivation theories, assessment paradigms, and digital learning pathway models.

Motivation Theories

The influence of digital badges on learner engagement is often explained through Self-Determination Theory (SDT) and Expectancy-Value Theory (EVT). SDT views motivation as a continuum from extrinsic regulation to autonomous, intrinsic motivation, shaped by the needs for autonomy, competence, and relatedness (Deci & Ryan, 1985; Ryan & Deci, 2000). In micro-credentialing, SDT helps assess whether badges promote autonomous learning or simply act as external incentives. EVT adds that learners engage with tasks based on their expected success and the value they assign to the task, including attainment, utility, intrinsic value, and perceived cost (Eccles & Wigfield, 2002; Wigfield & Eccles, 2000). Applied to digital credentials, EVT explains why learners value badges differently depending on their perceived professional usefulness, likelihood of success, and required cognitive effort (Kayyali et al., 2023).

Assessment Frameworks

From an instructional design perspective, the pedagogical validity of digital badges depends on constructive alignment (Biggs, 1996). This framework requires micro-credentials to align intended learning outcomes, instructional activities, assessment evidence, and evaluation criteria (Biggs & Tang, 2011). Without this alignment, badges risk becoming superficial tokens rather than valid indicators of quality learning. Their formative use is also shaped by self-regulated learning and feedback models. Effective badge systems require

clear criteria and timely feedback to build assessment literacy, support metacognitive reflection, and help learners regulate their learning (Nicol & Macfarlane-Dick, 2006).

Digital Credentialing and Learning Pathways

Finally, the implementation of micro-credentials is grounded in digital learning pathway models. These models view digital badges not as isolated achievements but as interconnected, stackable milestones that make learning visible, coherent, and portable (Gibson et al., 2016). By mapping learning journeys, digital pathways support lifelong learning and help transfer verified competencies from higher education to the workforce. Contemporary micro-credentialing frameworks also stress the need for digital ecosystems that combine rigorous academic assessment with employer-facing credential value, ensuring the relevance and sustainability of digital badging initiatives (Lim et al., 2018).

METHODOLOGY

Research Design

To address the established research aims, this study employed a narrative literature review design (Sukhera, 2022a). This approach enables an interpretive synthesis of broad, multidisciplinary scholarship encompassing quantitative, qualitative, and mixed-methods research by providing a necessary alternative to strictly systematic reviews that often privilege narrowly defined evidence and exclude diverse methodological traditions (Ferrari, 2015; Varpio et al., 2024). Consequently, this design is optimal for exploring the rapidly evolving phenomenon of digital badging, as it facilitates a critical and contextual reading of the field. Rather than treating the empirical literature as a set of isolated findings, the narrative method allows researchers to trace how contemporary ideas have evolved, identify unresolved pedagogical and ideological debates, and develop a coherent account of the current state of knowledge (Byrne, 2016; Sukhera, 2022b). To enhance methodological rigor, this review explicitly defines its scope, boundaries, search process, and strict empirical selection criteria (Ferrari, 2015; Sukhera, 2022b).

Search Strategy and Information Sources

A comprehensive literature search was undertaken to identify relevant empirical studies, conceptual frameworks, and high-quality grey literature published in peer-reviewed journals, international conference proceedings, and institutional repositories. Given the multidisciplinary nature of digital badges and micro-credentials, the search strategy targeted major academic databases and scholarly aggregators, specifically EBSCOhost, PubMed, and Google Scholar. The three databases were selected for their complementary strengths. EBSCOhost offers broad coverage of leading educational research, PubMed captures education-related interventions in medicine and health sciences, and Google Scholar provides wider access to international conference proceedings and empirical doctoral theses. These sources help reduce publication bias while maintaining strict methodological inclusion criteria.

To guide the search process, a Boolean search string was developed using key terms associated with the core phenomenon and its principal contexts of application. The primary search string included the following combinations: ("digital badge*" OR "micro-credential*" OR "open badge*") AND ("higher education" OR "university" OR "professional development" OR "employability"). The search process was iterative rather than strictly linear. In addition to database searching, the reference lists of foundational and highly relevant studies were examined to identify further sources that may not have been retrieved during the initial search. This citation-mining process helped strengthen the comprehensiveness of the review by capturing influential works across related strands of scholarship.

Inclusion and Exclusion Criteria

To maintain methodological rigor and ensure direct alignment with the study's objectives, explicit inclusion and exclusion criteria were established and applied to the retrieved literature (see **Table 1**). The timeframe for data collection was strictly bound to literature published between January 2017 and early 2025, capturing the most recent decade of rapid technological shifts toward competency-based credentialing.

Only peer-reviewed articles were included to ensure academic rigor, methodological validity, and reliable evidence. The search was limited to English-language articles to match the researcher's linguistic proficiency and support accurate interpretation of complex pedagogical concepts. This restriction is acknowledged as a limitation because it may introduce selection bias by excluding relevant digital credentialing studies from non-English-speaking educational contexts.

Data Evaluation and Selection

To ensure transparency and methodological reproducibility, a structured screening protocol was strictly adhered to. The initial database search yielded 915 records (EBSCOhost: n = 243; PubMed: n = 52; Google Scholar: n = 620). After removing 137 duplicate records, the remaining 778 unique records underwent title and abstract screening, resulting in the exclusion of 603 records that did not meet the thematic scope of the review. The remaining 175 reports were sought for full-text retrieval; however, 18 could not be retrieved due to the unavailability of full text.

The full texts of the remaining 157 reports were then critically assessed for eligibility against the strict criteria outlined in **Table 1**. During this comprehensive assessment phase, 143 reports were excluded for the following specific reasons: not empirical (n = 41); did not explicitly examine digital badges, micro-credentials, or open badges (n = 33); took place outside a higher education, professional development, or employability context (n = 29); focused exclusively on K–12 settings without a relevant educator professional development link (n = 17); lacked a clear methodological framework (n = 15); or maintained a policy-only focus without pedagogical, professional, implementation, or stakeholder relevance (n = 8). This rigorous selection process yielded a final corpus of 14 high-quality empirical research studies.

Extraction, Analysis, and Reliability

To align the evidence with the study's four objectives, data from the 14 included studies were extracted into a standardized matrix. Two researchers independently reviewed and double-coded the studies to strengthen

Table 1. Inclusion and exclusion criteria

Criteria	Inclusion	Exclusion
Methodology	Peer-reviewed empirical research articles, case studies, theses, and formal conference proceedings.	Non-empirical reports, non-peer-reviewed opinion pieces, and studies lacking a clear methodological framework.
Language & Timeframe	Published in English between 2017 and 2025.	Published in languages other than English or prior to 2017.
Subject Focus	Explicitly examines the design, implementation, or pedagogical impact of digital badges, micro-credentials, or open badges.	Focuses solely on macro-level institutional policy without addressing pedagogical, professional, implementation, or stakeholder relevance.
Target Population	Higher education students, higher education faculty/educators (CPD), or employer perspectives regarding graduate employability.	Exclusive focus on K-12 educational environments without a relevant link to educator professional development.

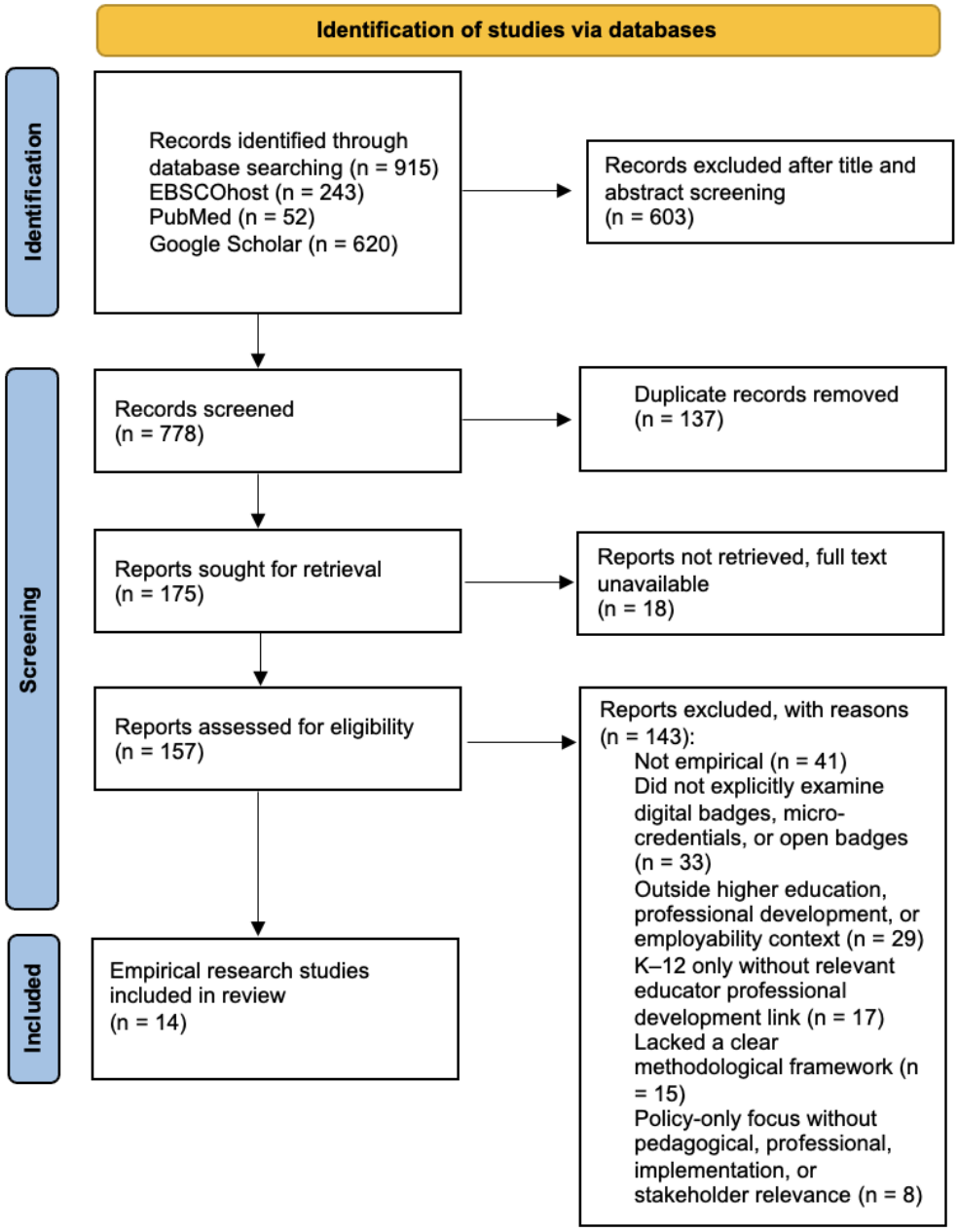

Figure 1. PRISMA flow chart of the article selection process

analytical reliability and validity. They cross-checked data on study design, participant demographics, and key empirical outcomes. Disagreements in thematic categorization were resolved through discussion and consensus, helping reduce confirmation bias and maintain analytical consistency.

After data extraction, a hybrid inductive and deductive thematic analysis was conducted to ensure structural alignment and interpretive depth. Deductively, the data were mapped onto the study's objectives and categorized into four domains: learner motivation and engagement, alternative assessment architectures, continuing professional development, and employability and workforce alignment. Inductively, the literature was synthesized to identify recurring patterns, structural contradictions, and unexpected findings. This dual approach helped reveal ideological tensions and methodological limitations that frame the review's discussion and core debates.

RESULTS

Table 2 presents a comprehensive summary of the 14 empirical studies included in this narrative review. The literature is chronologically presented by the year of publication, detailing the specific methodological designs, target populations, and primary empirical outcomes for each study.

Table 2. Summary of empirical studies on digital badges in higher education and continuing professional development

Author(s) & Year	Study Design	Context & Population	Key Empirical Findings
Brauer & Siklander (2017)	Qualitative study (group interviews and thematic analysis).	Vocational teacher education, Finland.	Highlighted that automated feedback is insufficient when badge applications are rejected; students required and strongly preferred expert/instructor evaluation to guide complex competency development.
Carey & Stefaniak (2018)	Qualitative interview study (phenomenological).	Higher education badge leaders, US.	Revealed that participation-based badges are perceived as significantly less meaningful than skill-based badges, which require explicit evidence of mastery and strict evaluation criteria.
Fulton (2019)	Qualitative case study.	Undergraduate Social Media module, Ireland.	Demonstrated that external open badges successfully linked academic learning to professional identity, with students highly valuing the ability to export and display badges on LinkedIn for prospective employers.
Gibbons (2019)	Mixed-methods case study (surveys, journals, interviews).	Undergraduate Civil Engineering students, Ireland.	Revealed that "mystery badges" added intrigue to the curriculum, and that badges rewarding 100% attendance were highly valued by employers as indicators of desirable professional traits.
Donnelly & Maguire (2020)	Reflective case study / descriptive evaluation.	Higher education faculty, Ireland.	Successfully utilized collaborative "peer triads" within a national badge ecosystem to manage assessment workloads, fostering communities of practice away from hierarchical grading for adult learners.
Risquez et al. (2020)	Mixed-methods research (surveys and focus groups).	Higher education faculty, Ireland.	Found that digital badges served as a weak initial motivator for enrolling in CPD, but acted as a crucial extrinsic catalyst to ensure course completion and sustained engagement for time-poor academics.
Gregg et al. (2022)	Quantitative survey study (correlational).	Undergraduate Engineering students, US.	Demonstrated that digital badges drive both intrinsic and extrinsic situational motivation, with female students reporting significantly higher intrinsic motivation and perceived badge utility than males.
Goulding et al. (2024)	Mixed-methods research (surveys and focus groups).	Undergraduate Initial Teacher Education, Australia.	Found that replacing traditional marks with digital badges reduced grade anxiety for some students but simultaneously induced severe stress and uncertainty for others who found the badges difficult to interpret without a numerical grade.
Raj & Divya (2024)	Mixed-methods interventional study.	1st-year Medical Undergraduates, India.	Integrating badges into online modules significantly increased students' confidence, focus on specific learning objectives, and motivation to regularly attend online classes.
Väätäjä et al. (2024)	Quantitative pilot study (online questionnaire).	Continuing education MOOCs, Finland.	Piloted a three-level "stackable" framework (from nanocredentials to metacredentials); found badges generally motivating and encouraging, though a subset (approx. 20%) perceived no educational value.

Table 2. ***Continued.***

Author(s) & Year	Study Design	Context & Population	Key Empirical Findings
Velázquez-García et al. (2024)	Quasi-experimental design (with control group).	Undergraduate Business Relations students, Mexico.	Provided objective evidence that a gamified digital badge system improved academic outcomes, resulting in significantly higher average grades and lower dropout rates compared to a control group.
Bobrytska et al. (2025)	Mixed-methods (one-group pretest-posttest and focus groups).	Master's students & employers, Ukraine.	Found that micro-credentials significantly enhanced student engagement and perceived employability, though employers stressed the necessity of incorporating emerging soft skills to maintain labor market relevance.
Galindo & Fennelly-Atkinson (2025)	Mixed-methods (explanatory sequential design).	High-volume badge earners (educators), US.	Identified a motivational shift among users earning 10+ badges: while initial engagement was often sparked by extrinsic rewards (pay or advancement), sustained persistence required internal motivators like personal interest and improving practice.
Pelizzari & Ferrari (2025)	Quantitative survey study.	Media Education Master's students, Italy.	Found that non-working and female students attributed significantly higher educational value to badges, though some students questioned whether badges truly represented their abilities without teacher emphasis.

The evidence summarized in **Table 2** reveals several salient patterns concerning the efficacy, implementation, and pedagogical significance of digital badges in higher education and continuing professional development. Across the reviewed studies, digital credentials appear to have moved beyond their early use as experimental gamification features and are increasingly positioned as pedagogically consequential instruments that shape learner motivation, assessment design, and workforce employability (Bobrytska et al., 2025; Gregg et al., 2022). Empirical findings further suggest that systematically integrated badge frameworks can generate measurable academic benefits, including higher average grades and lower dropout rates compared with non-gamified cohorts (Velázquez-García et al., 2024).

A central pattern in the literature is the dual nature of learner motivation. Digital badges often serve as extrinsic incentives, especially for encouraging initial participation in professional development (Risquez et al., 2020). However, sustained engagement depends on intrinsic motivation and learners' perception of badges as meaningful evidence of achievement (Galindo & Fennelly-Atkinson, 2025). Digital credentialing has also been linked to stronger learner confidence, clearer focus on instructional objectives, and more consistent engagement in digital learning environments (Raj & Divya, 2024). These effects vary by demographic and situational factors, with non-working students, female learners, and frequent badge earners reporting greater educational utility and intrinsic value than other groups (Galindo & Fennelly-Atkinson, 2025; Gregg et al., 2022; Pelizzari & Ferrari, 2025).

In assessment design, the literature shows a tension between the structural benefits of badge-based systems and learners' need for clear interpretation. Stackable credentials, including nanocredentials and metacredentials, offer transparent, granular alternatives to traditional numerical grading (Väätäjä et al., 2024). However, they must be implemented through rigorous assessment principles. Stakeholders often view skill-based badges, which require clear evidence of mastery and defined criteria, as more meaningful than participation-based tokens (Carey & Stefaniak, 2018). Still, integrating badges can create cognitive and emotional challenges. Replacing grades with badges reduced grade-related anxiety for some students but increased stress for others who struggled to assess their academic standing without numerical scores (Goulding et al., 2024). These findings suggest that automated badging systems cannot replace intentional

pedagogical support. They require instructor framing, expert guidance, and personalized feedback, especially when badge applications are rejected (Brauer & Siklander, 2017; Pelizzari & Ferrari, 2025).

Finally, the synthesized evidence highlights the role of digital credentials in workforce alignment and professional identity formation. By linking academic achievements to professional networks (Fulton, 2019) and supporting peer learning beyond hierarchical grading systems (Donnelly & Maguire, 2020), digital badges can bridge academic and professional contexts. Their value is strongest when they communicate technical competence, verifiable soft skills, professional dispositions, and commitment to lifelong learning (Bobrytska et al., 2025; Gibbons, 2019). The value of digital badges lies not in the token itself but in their alignment with authentic competencies, transparent evaluation criteria, and supportive pedagogical conditions.

DISCUSSION

Digital badges have gained increasing attention in higher education as tools for documenting learning, shaping engagement, supporting professional development, and strengthening the connection between academic achievement and workplace expectations. The literature no longer treats them simply as gamified incentives. Instead, badges are increasingly framed as pedagogical and credentialing mechanisms whose value depends on design quality, assessment credibility, learner support, and professional relevance. At the same time, the field does not present digital badges as uniformly beneficial or uncontested. Rather, the literature highlights both their promise and the tensions that shape their adoption, interpretation, and legitimacy across academic and professional contexts.

Thematic Synthesis of Empirical Evidence

Student Motivation, Engagement, and Perceptions

A substantial body of research examines the influence of digital badges on student motivation and engagement through the lenses of gamification (Brauer & Siklander, 2017; Velázquez-García et al., 2024), Achievement Goal Theory (AGT), and Self-Determination Theory (SDT) (Gibbons, 2019; Gregg et al., 2022). Across these perspectives, badges are understood not merely as extrinsic rewards, but as pedagogical tools that can also support intrinsic motivation when they are intentionally designed and meaningfully embedded in learning environments. Research suggests that badging systems can promote goal setting, sustained attention, and skill mastery across disciplines such as engineering (Gibbons, 2019; Gregg et al., 2022), medicine (Raj & Divya, 2024), and business education (Velázquez-García et al., 2024). Studies also associate digital badges with improved academic outcomes, including higher achievement and lower dropout rates than non-gamified settings (Velázquez-García et al., 2024). Quantitative evidence using measures such as the Intrinsic Motivation Inventory and the Situational Motivation Scale further indicates that badges can enhance learners' interest, confidence, and enjoyment over an academic term (Gibbons, 2019; Gregg et al., 2022).

However, the literature consistently shows that the motivational value of badges depends less on their presence than on how they are designed and interpreted. Sustained engagement is more likely when badges are aligned with meaningful competencies and valued forms of achievement (Carey & Stefaniak, 2018). Although external incentives, such as collecting badges or outperforming peers, may stimulate initial participation, longer-term persistence appears to depend more on whether learners perceive badges as credible markers of genuine accomplishment (Galindo & Fennelly-Atkinson, 2025). Within this framework, proficiency-based badges are often regarded as more meaningful than participation-based badges because they require verifiable evidence of competence (Carey & Stefaniak, 2018). Yet these perceptions remain context dependent. In some settings, participation-based badges tied to attendance or consistency are also valued because students view them as visible and transferable indicators of reliability, commitment, and professional readiness (Gibbons, 2019).

Responses to digital badges also vary across learner groups. Several studies identify gender differences, with female students often reporting higher intrinsic motivation, assigning greater educational value to badging systems, and perceiving stronger professional relevance in digital credentials than male students (Gregg et al., 2022; Pelizzari & Ferrari, 2025). Employment status also appears to shape these perceptions. Pelizzari and Ferrari (2025), for example, found that non-working students assigned greater educational value to badge-based tools than working students, suggesting that learners without external employment commitments may rely more on formal academic recognition to sustain engagement. Prior academic performance likewise appears to matter, with higher-achieving students often benefiting more from competitive gamified features such as badges and leaderboards (Gibbons, 2019).

Beyond motivation, badges also shape learners' emotional and interpretive responses, which in turn affect engagement and self-efficacy. For some students, replacing or supplementing numerical grades with badges may reduce grade-related anxiety by shifting attention from abstract scores to feedback, visible accomplishment, and skill development (Goulding et al., 2024). The visual and incremental representation of achievement can strengthen confidence and encourage more active participation in coursework and online learning environments (Gibbons, 2019; Raj & Divya, 2024). At the same time, badge-based systems do not benefit all learners equally or automatically. When traditional grades are removed without sufficient scaffolding, some students may experience greater uncertainty and stress, particularly when they depend on numerical indicators to judge their academic standing (Goulding et al., 2024). Similarly, badges that are poorly integrated, difficult to interpret, or perceived as misaligned with actual ability may generate frustration rather than motivation. These risks are especially pronounced when the platform lacks usability or when instructors fail to actively support and legitimize the system within the learning process (Goulding et al., 2024; Pelizzari & Ferrari, 2025).

Assessment, Badge System Design, and Feedback

Another major strand of research positions digital badges as alternative assessment tools within higher education. Rather than functioning only as supplementary rewards, well-designed badge systems are increasingly treated as integral to instructional design and as viable instruments for competency-based assessment (Carey & Stefaniak, 2018; Goulding et al., 2024). Their pedagogical value lies in their ability to capture dimensions of learning that conventional numerical grades often reduce to a single score, especially when badge metadata includes explicit assessment criteria and verifiable evidence of achievement (Carey & Stefaniak, 2018; Velázquez-García et al., 2024). In this respect, badge credibility depends not only on making achievement visible, but also on aligning criteria with academic and professional standards. Scholars therefore emphasize grounding badges in established evaluative frameworks, such as the Structure of Observed Learning Outcomes (SOLO) taxonomy and the CAPRI framework, so that discrete competencies can be positioned within a coherent and assessable hierarchy (Goulding et al., 2024). When designed in this way, badges offer a more transparent and nuanced account of learning by documenting demonstrated mastery rather than mere participation (Carey & Stefaniak, 2018; Goulding et al., 2024).

The literature also highlights the value of hierarchical and modular badge structures, often described as stackable systems, in supporting competency-oriented assessment (Carey & Stefaniak, 2018; Väätäjä et al., 2024). These systems organize learning into progressive stages, allowing students to accumulate smaller achievements that build toward broader credentials. Väätäjä et al. (2024), for example, describe a multi-tiered model in which foundational nanocredentials earned through microlearning units develop into intermediate microcredentials and culminate in metacredentials across a larger program or course sequence. Such scaffolded designs can support self-regulation by providing clear milestones and progressively challenging goals, thereby making learning pathways more manageable and personalized (Carey & Stefaniak, 2018). At the same time, system design must remain attentive to implementation demands, particularly instructor

workload. Some studies therefore recommend thematic grouping of badges rather than continuous micro-assessment in order to balance evaluative rigor with administrative feasibility (Fulton, 2019).

A further strength of digital badging systems lies in their capacity to support structured and immediate feedback (Brauer & Siklander, 2017; Fulton, 2019; Goulding et al., 2024). When integrated into Learning Management Systems, badges can provide continuous visual indicators of progress that help learners monitor skill development, interpret assessment expectations, and identify areas for improvement (Fulton, 2019). In this way, badges strengthen the formative dimension of assessment by making progression more visible and actionable. However, the literature is equally clear that badges alone cannot replace pedagogical guidance. Automated systems may function effectively for straightforward or objective tasks, but they are less effective when learners fail to meet criteria or when badge applications are rejected (Brauer & Siklander, 2017). Under such conditions, badges function most effectively as formative tools when paired with timely, personalized, and expert instructor feedback. This human element remains essential for reducing learner uncertainty, clarifying performance gaps, and supporting revision, skill development, and successful resubmission (Brauer & Siklander, 2017; Goulding et al., 2024).

Continuing Professional Development for Educators

Beyond student learning, digital badges and micro-credentials have also gained prominence as flexible tools for professional development in higher education. As institutions seek agile and scalable ways to strengthen educator capacity in emerging areas such as digital pedagogy, micro-credentials are increasingly presented as alternatives to traditional professional development models (Donnelly & Maguire, 2020; Risquez et al., 2020). A key contribution of these systems lies in their capacity to recognize, validate, and formalize forms of professional learning that often remain invisible within conventional accredited pathways (Donnelly & Maguire, 2020). By offering targeted and accessible development opportunities, digital badges allow institutions to respond more effectively to rapidly changing educational demands while supporting the continued growth of educator competencies in specific areas of practice (Donnelly & Maguire, 2020).

Although the literature generally supports digital badges as incentives for professional learning, it also shows that educators' motivations for engaging with these credentials are complex and may evolve over time (Galindo & Fennelly-Atkinson, 2025; Risquez et al., 2020). For academics balancing substantial teaching, research, and administrative responsibilities, digital badges can serve as important extrinsic motivators that encourage completion of CPD activities, even when initial participation is also driven by genuine interest in the topic (Risquez et al., 2020). Longitudinal evidence, however, suggests that sustained engagement with micro-credentials is increasingly shaped by intrinsic motivation. Research on educators who accumulated large numbers of micro-credentials, particularly those earning more than ten badges, indicates that although initial participation may be prompted by external incentives such as salary progression or mandatory continuing education requirements, continued participation is more strongly associated with a commitment to lifelong learning, a growth-oriented professional identity, and a desire to improve teaching practice for diverse student populations (Galindo & Fennelly-Atkinson, 2025). These findings suggest that the value of micro-credentials in CPD extends beyond compliance and reward structures and may support deeper forms of professional self-development.

The literature further suggests that successful implementation of badging systems for CPD, particularly at institutional or national scale, requires assessment models that move beyond rigid, instructor-led approaches. In response to the practical challenges of assessing adult learners in large-scale professional development systems, scholars have advocated collaborative and community-oriented forms of evaluation (Donnelly & Maguire, 2020; Risquez et al., 2020). One prominent example is the peer triad model, in which small groups of professionals jointly review, discuss, and assess one another's evidence of learning against shared criteria (Donnelly & Maguire, 2020). This approach helps maintain the credibility and rigor of badge-based recognition while reducing the assessment burden on facilitators and institutions. More importantly, it reframes

professional development as a participatory and dialogic process grounded in collegial trust, shared reflection, and peer recognition. In doing so, it supports the development of sustainable communities of practice and shifts CPD away from purely hierarchical models of accreditation toward more collaborative and professionally meaningful forms of learning engagement (Donnelly & Maguire, 2020; Risquez et al., 2020).

Employability and Workforce Alignment

Another major theme in the literature concerns the role of digital badges in addressing the persistent skills gap between higher education and the contemporary labor market (Bobrytska et al., 2025; Carey & Stefaniak, 2018). Traditional academic transcripts are increasingly criticized for offering limited and reductionist accounts of student achievement, giving employers little insight into graduates' specific and demonstrable competencies (Gregg et al., 2022). By contrast, digital open badges provide a more transparent and detailed form of micro-credentialing because they can embed rich metadata, including information about the issuing institution, explicit assessment criteria, and links to verifiable work products that conventional credentials rarely include (Carey & Stefaniak, 2018; Gregg et al., 2022). This capacity allows students to build a more granular and evidence-based record of achievement that aligns more closely with immediate workforce expectations and evolving skill demands (Bobrytska et al., 2025).

From an industry perspective, employers increasingly view micro-credentials as useful indicators of both technical competence and transferable professional skills (Bobrytska et al., 2025; Galindo & Fennelly-Atkinson, 2025). Rather than treating badges as symbolic markers of participation, employers may interpret certain forms of gamified recognition, such as badges awarded for voluntary resubmission or peer-based recognition, as evidence of resilience, self-awareness, collaboration, and commitment to continuous development (Gibbons, 2019). In this sense, micro-credentials are positioned as agile tools for identifying candidates with current and relevant competencies in rapidly changing sectors (Galindo & Fennelly-Atkinson, 2025). At the same time, the literature emphasizes that their value in recruitment depends on continued alignment with emerging industry standards, leadership expectations, and changing occupational demands (Bobrytska et al., 2025).

The literature also indicates that learners attach considerable value to digital badges as tools for strengthening professional visibility and employability (Fulton, 2019; Gibbons, 2019). Students particularly value the portability and shareability of open badges, often using them to enhance professional profiles on platforms such as LinkedIn and to supplement conventional résumés with visible evidence of skill development and digital competence (Fulton, 2019; Gregg et al., 2022). Through these practices, learners often regard badges not simply as records of academic achievement, but as tools for constructing a broader and more compelling narrative of their educational experience, personal development, and professional identity (Gibbons, 2019). Digital badges may therefore offer students a distinctive means of differentiating themselves in increasingly competitive employment contexts.

Despite these advantages, the literature repeatedly identifies trust and credibility as central challenges for digital credentials in the broader labor market (Carey & Stefaniak, 2018; Gibbons, 2019). Scholars consistently argue that for badges to attain value beyond academic settings, they must be developed through sustained collaboration between educational institutions and industry stakeholders (Bobrytska et al., 2025; Gibbons, 2019). Involving employers in the design of badge criteria helps ensure that recognized competencies reflect authentic workplace expectations and strengthens confidence in the legitimacy of these credentials during recruitment and selection. Such collaboration is therefore essential not only for improving workforce alignment, but also for securing the institutional and professional trust necessary for digital badges to function as credible indicators of graduate capability.

Key Debates and Competing Perspectives

One major debate concerns the tension between standardization and contextual flexibility. Advocates of standardization argue that some degree of common framework is necessary if digital badges are to achieve inter-institutional recognition, academic credibility, and employer acceptance (Carey & Stefaniak, 2018). From this perspective, badges require standardized metadata structures and recognizable competency frameworks to function as transferable and trustworthy credentials rather than fragmented local markers of achievement. This view is reinforced by the argument that alignment with industry expectations is essential if micro-credentials are to retain labor market value (Bobrytska et al., 2025; Carey & Stefaniak, 2018). Critics, however, contend that excessive standardization may undermine the openness and adaptability that make digital badges attractive. They argue that rigid frameworks and prescribed pedagogies can reproduce the hierarchical logics of traditional credentialing systems, limiting the capacity of badges to respond to local contexts, diverse learners, and shifting workforce demands (Carey & Stefaniak, 2018). The debate is therefore not merely technical but epistemological, reflecting competing assumptions about whether credibility is best secured through uniformity or contextual relevance and innovation.

A second area of tension concerns the pedagogical implications of replacing traditional numerical grades with badge-based assessment. On one hand, the literature suggests that digital badges can reduce grade-related anxiety by shifting attention from abstract numerical scores to visible progress, actionable feedback, and the demonstration of specific competencies (Goulding et al., 2024). In this sense, badge-based assessment may offer a more formative and learner-centered alternative to conventional grading, supporting confidence and encouraging a focus on mastery. On the other hand, badges may generate uncertainty and dissatisfaction in high-stakes academic environments when students continue to rely on numerical grades as familiar indicators of performance. Studies indicate that removing traditional marks in favor of badges can create stress and interpretive difficulty, especially when badges are not accompanied by sufficiently explicit written feedback (Goulding et al., 2024; Pelizzari & Ferrari, 2025). Under these conditions, learners may struggle to interpret badge-based outcomes or may regard them as inadequate representations of their academic ability. This tension reflects a broader friction between established assessment cultures and emerging models of competency-based recognition.

A third debate centers on assessment authority, particularly whether badges should be issued by instructors, peers, or both. Peer-awarded badges are often valued for their potential to foster collaboration, mutual recognition, and communities of practice, while also acknowledging forms of learning and contribution that may not be fully visible to instructors (Donnelly & Maguire, 2020; Gibbons, 2019). In some cases, employers also view peer-issued badges as meaningful indicators of interpersonal competence, teamwork, and communication, qualities not always captured through formal curricular assessment (Gibbons, 2019). However, this decentralization of evaluative authority remains contentious in higher education. Concerns about badge inflation, favoritism, and the influence of social relationships have led both students and faculty to question the reliability of peer nomination as a basis for formal recognition (Gibbons, 2019). As a result, instructor-issued badges often retain greater perceived legitimacy, particularly in cases involving complex assessment, application rejection, or disputed performance judgments (Brauer & Siklander, 2017; Gibbons, 2019). This debate reveals an underlying tension between democratic participation and institutional authority in the validation of learning.

The literature also identifies divergent perspectives on gamification mechanics, particularly competitive leaderboards and the transparency of badge criteria. From an organizational perspective, public ranking systems may be viewed as useful tools for simulating workplace competition and motivating high-achieving students to pursue excellence (Gibbons, 2019). However, pedagogical research raises concerns that such features can demoralize lower-performing students, intensify stress, and create exclusionary learning environments for those less comfortable with competition (Gibbons, 2019; Pelizzari & Ferrari, 2025). A related

tension concerns whether badge criteria should be transparent from the outset or partially concealed. Proponents of hidden or "mystery" badges argue that uncertainty can stimulate curiosity, increase participation, and reduce the likelihood that students will simply strategize around assessment criteria (Gibbons, 2019). By contrast, students and instructional designers often favor transparent criteria, emphasizing that clear expectations are necessary for self-regulation, deliberate study planning, and meaningful interpretation of assessment tasks in relation to badge outcomes (Carey & Stefaniak, 2018; Fulton, 2019; Gibbons, 2019). These competing positions illustrate the challenge of balancing motivational intrigue with pedagogical clarity.

A final debate concerns the threshold required for earning a badge, particularly the distinction between skill-based rigor and participation-based recognition. Instructional design scholarship generally maintains that badges are most meaningful when awarded on the basis of demonstrated competence rather than mere attendance or task completion (Carey & Stefaniak, 2018). From this perspective, badges derive their academic and motivational value from the rigor of the evidence required to earn them. However, stakeholder-oriented research complicates this view by showing that some participation-based badges, especially those recognizing full attendance, are highly valued by both students and employers (Gibbons, 2019). Rather than being seen as superficial rewards, such badges may function as credible signals of dependability, discipline, and sustained professional commitment. This suggests that the perceived value of a badge may depend not only on whether it reflects mastery in a narrow academic sense, but also on the dispositions and habits that different stakeholders consider important.

Methodological Limitations and Identified Research Gaps

One persistent methodological limitation is the reliance on small and relatively homogeneous samples. Several studies draw on narrowly defined participant groups, including predominantly White, female cohorts with postgraduate qualifications (Galindo & Fennelly-Atkinson, 2025) or highly localized, discipline-specific student populations (Gibbons, 2019; Pelizzari & Ferrari, 2025). This raises questions about the extent to which current findings can be generalized across more diverse educational and professional settings. The literature is further constrained by its heavy dependence on self-reported surveys and focus group data, which remain vulnerable to personal bias, selective recall, and socially desirable responses. In many cases, such data are not sufficiently triangulated with independent behavioral evidence that could more reliably verify changes in motivation, engagement, or skill acquisition (Bobrytska et al., 2025; Gregg et al., 2022). Perspective bias is another notable weakness. Existing studies often privilege the views of badge designers, academic researchers, and selected industry collaborators, while giving less attention to the lived experiences of a broader range of badge earners and to the perspectives of human resource professionals who may ultimately interpret these credentials in employment contexts (Bobrytska et al., 2025; Carey & Stefaniak, 2018).

A further limitation is the short-term orientation of much of the existing research. Many studies examine badge implementation over a single academic semester or within a discrete professional development module, providing only a limited view of sustained effects (Bobrytska et al., 2025; Gibbons, 2019). Because longitudinal studies remain scarce, it is difficult to determine whether reported gains in motivation, confidence, or engagement reflect lasting pedagogical benefits or only temporary responses to the novelty of a new gamified intervention. This unresolved issue, often described as the novelty factor, remains one of the most significant gaps in the literature. In professional settings, the same temporal limitation obscures the long-term labor market value of micro-credentials. More evidence is needed on how human resource professionals interpret digital badges in actual hiring processes and whether the accumulation of such credentials is associated with meaningful outcomes such as career advancement, promotion, or increased professional mobility (Bobrytska et al., 2025; Carey & Stefaniak, 2018; Galindo & Fennelly-Atkinson, 2025).

The literature also reveals important theoretical and pedagogical blind spots. Although digital badges are frequently designed to increase motivation and engagement, relatively little research has examined their possible adverse psychological effects. Further theoretical and empirical attention is needed to determine whether highly visible extrinsic rewards may, over time, undermine intrinsic motivation for some learners, especially when differences in life stage, employment status, or prior academic achievement are considered (Risquez et al., 2020). From a pedagogical perspective, research has only begun to explore more advanced and participatory forms of gamification. Future studies could move beyond conventional top-down credentialing models by examining learner-centered approaches in which students help define assessment criteria or participate in creating and awarding badges to peers (Gibbons, 2019). Scholars have also highlighted the need to examine how digital badging frameworks intersect with broader institutional processes, including staff recruitment, tenure and promotion systems, and formal professional accreditation structures (Donnelly & Maguire, 2020). Such work would clarify whether open credentials can be meaningfully integrated into established institutional and professional recognition systems.

Another major gap concerns contextual diversity and systemic inclusivity. The available evidence remains heavily Western-centered, limiting understanding of how digital badges are interpreted, adopted, and valued in non-Western educational and economic settings (Bobrytska et al., 2025). This geographical concentration points to the need for more culturally responsive and internationally comparative research capable of testing the transferability of current assumptions across diverse contexts. At the same time, system design and usability remain underexamined. Although digital badges are intended to make achievement more visible and interpretable, emerging studies suggest that poor interface design, platform complexity, and unclear visual presentation can instead produce confusion, stress, and cognitive overload for learners trying to understand their academic standing (Carey & Stefaniak, 2018; Goulding et al., 2024). Problems such as unreadable layouts, ambiguous color coding, and poorly structured graphic elements may undermine the accessibility and pedagogical usefulness of badge systems. Future research should therefore give greater attention to usability studies, particularly those examining how platform design interacts with learner anxiety, comprehension, and the effectiveness of automated or instructor-mediated feedback, especially when badge applications are rejected (Brauer & Siklander, 2017).

CONCLUSION

Higher education remains challenged by a persistent misalignment between academic outcomes and workforce demands, a gap that traditional transcripts often fail to bridge. By synthesizing previously fragmented empirical evidence, this review adds critical new knowledge to the existing literature by decoupling digital credentials from purely behaviorist gamification models and repositioning them as complex pedagogical instruments. Specifically, this study advances current scholarship by mapping the underlying structural tensions between the need for standardized labor market recognition and the contextual flexibility required for meaningful formative assessment. This synthesis demonstrates that digital badges operate effectively not merely as administrative tokens, but as active mediators of self-regulated learning, continuous professional development, and professional identity formation. This review establishes that while digital credentials offer transformative potential for competency-based education, their efficacy is strictly contingent upon rigorous instructional scaffolding, transparent evaluative criteria, and sustained collaborative design between higher education institutions and industry stakeholders.

FUTURE RESEARCH DIRECTIONS

Given the methodological constraints of the current evidence base, a targeted research agenda is required to advance the field of digital credentialing. Foremost, researchers must move beyond generic calls for long-term studies by designing specific, multi-year longitudinal investigations. Future longitudinal research should

explicitly track learners across multiple academic semesters to isolate sustained intrinsic motivation and pedagogical impact from short-term novelty effects. Additionally, post-graduation longitudinal tracking, such as three-to-five-year cohort studies, is vital to quantify the actual, rather than self-reported or perceived, utility of micro-credentials in securing employment, accelerating career mobility, and satisfying evolving human resource screening processes.

Furthermore, future inquiry must transition from a reliance on self-reported data toward the integration of objective behavioral analytics, assessing exactly how learners interact with badge metadata and learning management systems in real time. This includes rigorous usability studies to investigate how platform design features either mitigate or inadvertently exacerbate cognitive overload and grade-related anxiety. In parallel, research must critically examine institutional adoption by identifying specific implementation barriers, such as faculty workload concerns, technological integration challenges, and policy misalignment. Finally, there is a pressing need for cross-cultural comparative research to evaluate the equity of access and systemic inclusivity of badge frameworks outside Western-centric contexts. This should be conducted alongside critical psychological evaluations of competitive gamification mechanics, such as leaderboards, to ensure these systems promote equitable educational outcomes for diverse learner populations.

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