# Educational Framework for the Development of Online Micro-Credential for General Population: A Scoping Review Protocol

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## ABSTRACT

Similar to conventional learning, an effective pedagogical approach is crucial to ensure that online micro-credentials achieve their intended outcomes and learners can effectively transfer their newly acquired knowledge and skills to real-world applications. However, a lack of universally accepted frameworks for developing online micro-credential instruction leads to variability in the approaches used. This scoping review aims to address this gap by mapping the key aspects and elements of educational frameworks employed in creating online micro-credentials for the general population. The review will be conducted in accordance with the methodology for scoping reviews established by the Joanna Briggs Institute (JBI). The search strategy will include published studies from Scopus, EBSCOhost, and ERIC databases. Additional relevant literature will be retrieved from the advanced Google search engine, as well as government and university guidelines. Eligible studies will be limited to those published from 2013 onwards and in English. Two independent reviewers will perform the screening, selection, and data extraction processes. The findings will be presented in a combination of tabular format and narrative summary. They will be structured based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for scoping reviews (PRISMA-ScR) checklist.

**Keywords**: *micro-credential, digital badge, online learning, scoping review, protocol*

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## INTRODUCTION

Online learning encompasses any educational experience that involves interaction with or facilitated by digital technologies (1). Introduced back in 1960s (2), its adoption has rapidly gained momentum due to the COVID-19 pandemic restrictions (3,4). As traditional in-person education faced challenges, various forms of online learning emerged, catering to different educational needs and preferences (3,5) These include live virtual classes, asynchronous sessions, blended learning models, and massive open

online courses (MOOC) (6). The flexibility and accessibility of these platforms have made online learning increasingly popular across different fields and levels of education (7).

A micro-credential certification demonstrates proficiency in a specific set of knowledge, skills, and competencies within a focused area of study or practice (8,9). Micro-credentials offer a unique and valuable approach to online learning, particularly for upskilling and reskilling the labor force (10). What sets micro-credentials apart is the ability to accumulate them as credit units, which can be applied towards larger qualifications such as certificates or degrees (9,11). This modular approach is not only applicable to students, but it allows professionals to enhance their expertise continuously and remain competitive in the workforce (12). This route can also open alternative pathway for working adults to acquire knowledge and skills, ultimately leading to a qualification (13).

Micro-credentials are often interchangeably used with terms such as digital badge, digital credential (14), nano degree (15) and micro-master (16). The democratization of credentialing confers the ability for individuals and organizations with relevant expertise to formally recognize and validate valued skills, knowledge, or accomplishments through the issuance of digital badges, nano degrees, or digital credentials (17,18). Nano degrees and micro-masters are aggregations of micro-credentials centered on a specific domain, offering a more comprehensive and in-depth learning experience that can substantially improve employability by showcasing expertise in a particular area (19).

Micro-credentials can be broadly categorized into knowledge-based, which focuses on theoretical understanding of specific areas (17), and skills-based (20), which aim to develop practical abilities in particular domains. Additionally, some micro-credentials target the development of competencies, integrating both knowledge and skills to enhance job performance (21). These make micro-credentials versatile in addressing the diverse learning needs of individuals and working organizations. While micro-credentials are often delivered online, they can also be offered in face-to-face settings. However, the flexibility and accessibility of online platforms have made them the preferred mode of delivery (22). Digital badges are commonly used to recognize and showcase the achievements gained through micro-

credentials, providing learners with a portable and verifiable record of their new skills or knowledge (23,24).

Micro-credentials play a significant role in advancing Sustainable Development Goal (SDG) 4, which emphasizes inclusive, equitable quality education and lifelong learning opportunities for all (25). Micro-credentials democratize education by offering flexible, modular learning options, making it more accessible to underserved communities, working adults, and marginalized groups, thereby fostering equity (26). Additionally, micro-credentials contribute to equity-focused SDGs by reducing disparities and providing a pathway for individuals to overcome challenges, such as financial constraints or geographic limitations (25). Pursuing targeted, cost-effective learning opportunities empowers learners to adapt to a changing job market and ensures no one is left behind in pursuing education and economic opportunities. As a result, micro-credentials support lifelong learning and drive social mobility, creating a more equitable and inclusive society (25).

Many micro-credentials are delivered online (22). Like traditional face-to-face teaching, effective pedagogy is crucial in ensuring that online micro-credentials achieve their intended outcomes and learners can effectively transfer the newly acquired knowledge and skills to real-world applications (27). Reported key elements that contribute to its success include outcome-based learning (28), personalized learning paths (12), timely and constructive feedback (29), suitable assessment to demonstrate achievement (30), affordable costs (31), and alignment with industrial needs, particularly for micro-credentials aimed at upskilling the workforce (14). However, available literature often explores these elements in isolation with a lack of a comprehensive, integrated approach to guide developers in creation of online micro-credentials.

The Technological Pedagogical Content Knowledge (TPACK) framework has been widely used in traditional face-to-face teaching3qq to integrate technology, pedagogy, and content (32). However, TPACK is less suitable for online micro-credentials as it focuses on the integration of technology into traditional educational settings, where the content is typically broader and less specialized than in micro-

credentials. Additionally, the TPACK framework falls short in the context of online micro-credentials development, as it fails to account for the unique requirements of these credentials, such as the need for personalized learning experiences, targeted competency development, and strong alignment with industry demands (33). Archambault et al (2022) proposed an online learning pedagogy that is grounded in student-centeredness, constructivism and situated learning, and laid on five foundational pillars; (a) building relationships and community, (b) incorporating active learning, (c) leveraging learner agency, (d) embracing mastery learning, and (e) personalizing the learning process (34). However, this framework may fall short in addressing the needs of micro-credentials that are more industry-driven, focused, and shorter in duration (35).

Several guides, such as the "A European Approach to Micro-credentials" by the European Commission (36), outline the building blocks and constitutive elements for developing and delivering micro-credentials, emphasizing the need for transparent learning outcomes, recognition of achievement for academic or employment advancement, and quality assurance of the credential. While the guide outlines standards to promote portability of micro-credentials, it does not offer a detailed pedagogical framework for instructional design (36). Another exploratory study from Malaysia proposed a conceptual framework in online micro-credential development which include learning principles, e-learning theories, and assessment principles (37). However, no universally accepted frameworks for the development of online micro-credentials instruction exist, leading to variability in development approaches (22).

With the growing number of online micro-credentials being developed and offered, there is an increasing need for a consolidated understanding of the educational frameworks used to design and implement these credentials (38). Hence this scoping review aims to address this gap by mapping the key aspects and elements of educational frameworks employed in creating online micro-credentials for the general population. The review will provide a foundation for developing online micro-credential instruction through a robust educational framework.

# METHODS

This scoping review will be conducted based on the Joanna Briggs Institute's methodology for scoping reviews (39,40). The review process will involve five key steps: 1) formulating the review questions, 2) searching for relevant studies, 3) selecting eligible studies, 4) extracting and charting the data, and 5) analyzing and reporting the findings (41). The report will be constructed based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for scoping reviews (PRISMA-ScR) checklist (42). The study protocol has been registered with the Open Science Framework (https://osf.io/stf43).

## 2.1 Review Question

What are the key aspects or elements of educational frameworks used to develop online micro-credential instruction for the general population?

## 2.2 Search Strategy

The search strategy will include published studies from citation databases (Scopus and EBSCOhost) and subject database (ERIC). Other published literature will also be retrieved from the advanced Google search engine, government and university guidelines. The following search string: ("micro*credential" OR "nano*degree" OR "micro*master" OR "digital*credential" OR "online*certification" OR "digital*badge") AND (theory OR model OR design OR framework OR principle OR strategy OR develop*) will be used to identify relevant studies. Eligible studies from 2013 will be included to ensure important studies on online micro-credentials are captured. This search string has been piloted on selected databases and yielded around 30 to 974 records from each database (Appendix I).

## 2.3 Inclusion criteria

### 2.3.1 Participants

The review will include online micro-credentials studies involving general population, undergraduate and postgraduate students (Table 1). Online micro-credentials are often self-paced, targeting upskilling, reskilling, or accumulating credit units; only studies involving participants of 19-years-old and above will be included (not school-going students). Since the review aims to map elements of educational framework in developing online micro-credentials, studies requiring specialized or highly advanced digital literacy level will be excluded. Specialized or highly advanced digital literacy refers to skills beyond basic computer usage, internet navigation, and standard software applications. Examples include proficiency in programming languages (e.g., Python, Java), experience with complex data analysis software (e.g., R, SPSS), expertise in digital content creation using advanced tools (e.g., video editing, 3D modelling), or familiarity with specialized cybersecurity practices. These advanced skills are often not assumed or required for general online micro-credential participation and their inclusion could skew the findings and limit the generalizability of the review. In addition, studies focused on learners with cognitive and physical disabilities will be excluded to develop a framework suitable for the standard requirements. This review will consider learners, developers and policymakers' perspective. There will be no restrictions on country of origins or language of online micro-credentials delivery.

### 2.3.2 Concepts

The review will focus on key aspects or elements of educational framework in online micro-credential development. Hence, studies on pedagogical theory, model, design, framework, principle, or strategy used to develop online micro-credentials will be included. While these concepts may not be explicitly mentioned in the studies publication, the review will also consider studies that reported relevant description in planning, development, implementation, evaluation, and continuous quality improvement of online micro-credentials.

### 2.3.3 Context

The review context is micro-credentials, defined as a certification demonstrating proficiency in a specific set of knowledge, skills, and competencies within a focused area of study or practice (8,9). The review will confine its scope to online micro-credentials and exclude studies on micro-credentials offered in face-to-face setting, as these may use a different pedagogical approach. The review will also include studies using terms interchangeably with micro-credentials, such as digital badge, digital credential (14), nano degree, micro-master (16) and online certification. Any online micro-credentials will be considered, not limited to knowledge-based, skill-based, or competency-based. The review will exclude studies on MOOCs, which offers a larger volume of learning, often not for credit accumulation (36). The review will exclude studies on mobile applications, e-books, websites, or podcast-based courses.

## 2.4 Types of Sources

This scoping review will consider primary research (quantitative, qualitative, or mixed method study design, irrespective of methodological approach), secondary research (not limited to systematic review, scoping review and meta-analysis) and other published resources (limited to commentary, guideline, government document, policy paper and conference proceeding). To ensure the quality of the data, grey literature such as unpublished reports, white papers, and training documents will be excluded from this review. Grey literature often lacks rigorous peer review processes, standardized methodologies, and comprehensive reporting, which may introduce variability and undermine the reproducibility of findings. Additionally, grey literature can be challenging to locate exhaustively, potentially leading to selection bias and a lack of comparability across the included sources. A book or a book chapter will be excluded due to limited accessibility of its full content. Website or blogs resources will also be excluded due to variable scholarly quality. The review will only consider studies published in English.

**Table 1**. Inclusion and exclusion for articles screening in the scoping review

| Inclusion | Exclusion |
|---|---|

| | | |
|---|---|---|
| Participants | • General population, undergraduate and postgraduate students<br>• Age: 19 years and above<br>• Learners, developers and policy makers perspective | • School children<br>• Specialized or highly advanced digital literacy level<br>• Participants with cognitive and physical disabilities |
| Concept | • Pedagogical theory, model, design, framework, principle, or strategy in developing micro-credentials<br>• Description on planning, development, implementation, evaluation, or continuous quality improvement of micro-credentials | |
| Context | • Online micro-credential, digital badge, digital credential, nano degree, micro-master, or online certification.<br>• Knowledge-based, skill-based, or competency-based micro-credential | • Micro-credential offered in face-to-face setting<br>• MOOC<br>• Mobile applications, e-book, website, or podcast-based course |
| Types of sources | • Primary research (quantitative, qualitative, or mixed method study design, irrespective of methodological approach)<br>• Secondary research (not limited to systematic review, scoping review and meta-analysis)<br>• Other published resources (limited to commentary, guideline, government document, policy paper and conference proceeding)<br>• English language | • Grey literature (unpublished report, white paper, and training document)<br>• Book or book chapter<br>• Website or blogs |

## 2.5 Selection of Sources

Following search in selected databases, all identified citations will be collated in a Microsoft Excel sheet. Duplicates will be screened and removed. Abstracts will be screened by two independent reviewers (RB and US) based on the above inclusion and exclusion criteria. Discrepancy will be resolved by a third reviewer (SNH or NSR). Full text of the selected citations will be evaluated in detail

by two independent reviewers (RB and US) based on the above criteria. Any discrepancy in the selection will be resolved by a third reviewer (SNR or NSR). Justification of exclusion during full text screening will be recorded and reported. This process will be reported in the scoping review publication using a PRISMA-ScR flow diagram as illustrated in Figure 1 (42).

## 2.6 Data Extraction

Data from included studies will be extracted into a data extraction form using Microsoft Excel by the RB. The data will consist of relevant studies characteristics that are authors, article title, year of publication, country, study design and micro-credential specification (if reported). The data will also extract reported pedagogical theory, model, design, framework, principle, or strategy used to develop micro-credentials into the same spreadsheet. The spreadsheet will also extract information such as descriptions on planning, development, implementation, evaluation, and continuous quality improvement of micro-credentials. A draft of the data extraction form is included in Appendix II and will be modified as necessary during the data extraction. Any modification to the form will be reported in the scoping review publication.

## 2.7 Data Analysis and Presentation

All researchers will analyse the data descriptively using a tabular format (40). A narrative summary will also be provided to outline the key aspects and elements of educational frameworks used to develop online micro-credential instruction.
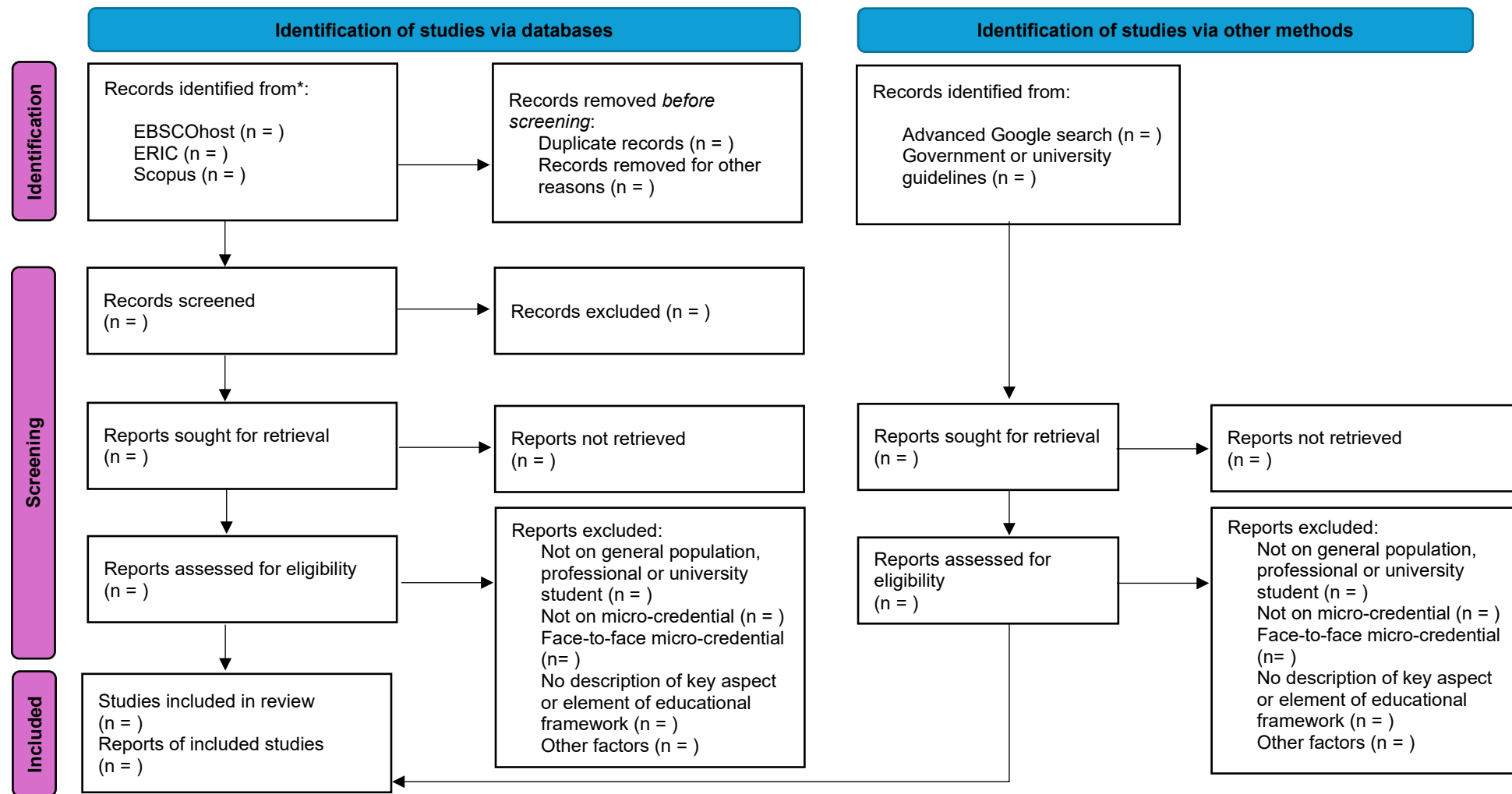
**Figure 1.** Search results, study selection and inclusion process.

# CONCLUSION

This scoping review aims to systematically identify and map the key aspects and elements of

educational frameworks employed in creating online micro-credentials for the general population. The

insights derived from this review will establish a basis for designing online micro-credential instruction

through a comprehensive educational framework. Furthermore, the findings from this review could

catalyse further research on best practices and innovative approaches to micro-credential pedagogy,

delivery, and evaluation. This could include exploring new pedagogical models, integrating emerging

technologies, and investigating the effectiveness of different assessment strategies to ensure micro

credentials effectively achieve their intended learning outcomes and meet the evolving needs of learners

and industries.

# ACKNOWLEDGEMENTS

# APPENDIX

### *Appendix I*

**Table 2.** Search conducted in the selected databases and search engine on 4 September 2024

| # | Query | ERIC | Scopus | EBSCOhost | Advanced Google Search |
|---|-------|------|--------|-----------|------------------------|
| 1 | "micro*credential"[Title/Abstract] OR "nano*degree"[Title/Abstract] OR "micro*master"[Title/Abstract] OR | 181 | 85 | 30 | 974 |

| | | | | | |
|---|---|---|---|---|---|
| | "digital*credential"[Title/Abstract] OR "online*certification"[Title/Abstract] OR "digital*badge"[Title/Abstract] | | | | |
| 2 | ("micro*credential"[Title/Abstract] OR "nano*degree"[Title/Abstract] OR "micro*master"[Title/Abstract] OR "digital*credential"[Title/Abstract] OR "online*certification"[Title/Abstract] OR "digital*badge"[Title/Abstract]) AND (theory[Title/Abstract] OR model[Title/Abstract] OR design[Title/Abstract] OR framework[Title/Abstract] OR principle[Title/Abstract] OR strategy[Title/Abstract] OR develop*[Title/Abstract]) | 9 | 61 | 19 | 549 |
| 3 | (("micro*credential"[Title/Abstract] OR "nano*degree"[Title/Abstract] OR "micro*master"[Title/Abstract] OR "digital*credential"[Title/Abstract] OR "online*certification"[Title/Abstract] OR "digital*badge"[Title/Abstract]) AND (theory[Title/Abstract] OR model[Title/Abstract] OR design[Title/Abstract] OR framework[Title/Abstract] OR principle[Title/Abstract] OR strategy[Title/Abstract] OR develop*[Title/Abstract])) AND (("2013"[Date - Publication] : "3000"[Date - Publication])) | 9 | 50 | 17 | 447 |

## *Appendix II*

**Table 3.** Data extraction form draft

| Authors | Title | Year of publication | Country | Study Design | Micro-credential title (if reported) | Key aspect / element to develop micro-credential |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

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