Management, Education & Innovation Review
Volume 2 Issue 1 May 2025
DOI: https://doi.org/10.53378/meir.153

Micro-credentials: What, why and whereto

[1]Flip Schutte & [2]Truida Oosthuizen

Abstract

In the rapidly evolving landscape of the modern workforce, traditional higher education models are being challenged to adapt to new types of students and the principles of lifelong learning, including the need for continuous professional development. Higher Education Institutions (HEIs) have traditionally used short-learning programs (SLPs) to meet this demand. However, the recent emergence of micro-credentials in the Higher Education landscape lacks a standardised definition, leading to confusion with SLPs. This paper aims to clarify these definitions, propose criteria for distinction, and establish a unique definition for micro-credentials. Statutory bodies may not yet be prepared for undergraduate programs with open curricula and flexible electives, where students construct qualifications through a series of integrated micro-credentials. This open process requires rigorous quality assurance and structural processes. Despite the entrenched nature of current qualification frameworks, international qualification authorities will be cautious in adopting such revolutionary changes. Nevertheless, digital platforms and new technologies offer immense possibilities, making timely adaptation crucial. Micro-credentials reflect a shift towards lifelong learning, essential for career progression and adaptability. For employers, they provide a reliable means of assessing competencies, developed in collaboration with industry stakeholders to ensure relevance. For individuals, they offer a pathway to upskill or reskill without traditional degrees' significant time and financial commitments. Preliminary findings suggest that micro-credentials are more flexible and industry-aligned than traditional SLPs. Based on the literature review, we propose a clear and distinctive definition of micro-credentials, emphasising their role in enhancing employability and supporting lifelong learning. The conclusions drawn from this study underscore the need for HEIs and statutory bodies to adopt standardised frameworks and accreditation for micro-credentials to maximise their potential benefits.

Keywords: *micro-credentials, short learning programmes, curriculum, life-long learning, technology*

Article History:

***Received**: February 10, 2025* ***Revised**: March 14, 2025*
***Accepted**: March 24, 2025* ***Published online**: May 20, 2025*

Suggested Citation:
Schutte, F. & Oosthuizen, T. (2025). Micro-credentials: What, why and whereto. *Management, Education & Innovation Review*, 2(1), 1-27. https://doi.org/10.53378/meir.153

About the authors:
[1]Corresponding author. PhD, Dean of Research, STADIO Higher Education. Email: flips@stadio.az.za
[2]PhD, Head of the School of Administration and Management. Email: truidao@stadio.ac.za

1. Introduction

In recent years, micro-credentialing has emerged as an innovative solution to the challenges faced by traditional higher education systems. Particularly in regions where accessibility, employability, and inclusivity are paramount, micro-credentials offer a promising alternative to conventional educational pathways. The concept of micro-credentials has gained significant attention, particularly within lifelong learning and the evolving demands of the modern workforce, and their adoption is taking place across the globe (Hopkins & Moller, 2024). They are often called digital badges, nano-degrees, or micro-certifications (Lemoine & Richardson, 2015). Micro-credentials represent a form of alternative credentialing that aims to recognise specific skills, knowledge, or achievements that traditional degree programs may not adequately capture (Kato et al., 2020). Micro-credentials differ from short learning programmes (SPLs), broader courses that explore a subject in greater depth and can last longer than a micro-credential (Casadesus et al., 2023).

According to Brown et al. (2021), there is still much confusion regarding the definition of micro-credentials and where they fit in the education and qualification framework. It seems as if there is consensus that it is called a micro-credential because it is a shorter form of a learning experience (1 – 25 hours of learning) linked to a specific competence, awarded within the context of non-formal learning, not explicitly quality assured by external quality assurance, thus less than a full degree (Boud & De St Jorre, 2021). It is considered an additional, alternative, or complementary option to a full traditional formal qualification such as a bachelor's degree, taking also into account workload and hours of learning.

The study acknowledges the impact of the COVID-19 pandemic, which accelerated the shift towards digital learning on MOOC (Massive Open Online Courses) platforms, on the adoption and implementation of micro-credentials. With the high rate of cell phone ownership and the tech-savvy nature of the younger generation, micro-credentials present accessible and adaptable learning opportunities that cater to the evolving needs of the job market.

This research assesses the potential of micro-credentials to complement existing qualifications or provide alternative pathways for individuals to acquire skills that enhance their employability and facilitate access to the labour market. Using a qualitative approach, the study analyses policy documents, published articles, and case studies of micro-

credentialing initiatives. The findings suggest that micro-credentials can bridge the gap between traditional education and the job market, offering a more inclusive and flexible framework for lifelong learning and employability. Scholars are at the moment looking back at traditional degree qualifications and look forward to the new demands of the digital era and the world of work. Micro-credentials are the doorway between the two epochs. However, the unanswered question is: Where do we go from here?

The current policy environment in many countries is characterised by a drive towards high-skill jobs and innovation, linking research to new forms of production and services (Winberg et al., 2014). This has led to considerable curriculum development across various fields and disciplines to support the "high skills" agenda. However, there is a concern about the lack of clarity regarding appropriate qualifications and skill levels for a developing country and what might differentiate skills programs from professional programs (Winberg et al., 2014).

Although the current high unemployment rate in many developing economies can be attributed to various factors, including the country's economic climate and the legacy of inequalities in educational provisioning (Vakalisa, 2005), it needs to be addressed, and micro-credentialing can help find a solution to this problem. The World Economic Forum estimates that more than 97 million new job roles may emerge globally by 2025. However, these jobs require higher levels of education with varied skill sets and competencies, so a new shift in learning is required to develop a future-fit workforce that can enable economic and societal growth and development (Govender & Singh, 2022).

This article addresses the gap regarding the uncertainty of the positioning, recognition, and standardisation of micro-credentials within formal education and employment frameworks. While micro-credentials are increasingly recognised as a bridge between traditional higher education and workforce demands, there remains a lack of clarity about their quality assurance, policy alignment, and integration into existing qualification frameworks. This study focuses on the rise of micro-credentialing, examining its potential to enhance the recognition and value of employability skills, thereby ensuring the relevance and applicability of the education system.

2. Methodology

According to Snyder (2019), the literature review has become more relevant than ever as a research method. A practical and well-conducted review synthesises research findings on a meta-level to create a strong foundation for advancing knowledge and facilitating theory development. Snyder distinguishes between three types of review methodologies: systematic, semi-systematic, and integrative approaches.

For this article, the integrative literature review methodology is considered the best. Snyder (2019) explains that some research questions require more creative data collection. In such cases, the integrative review approach is helpful. The purpose of the integrative review method is not to cover all articles ever published on the topic but rather to assess, combine, critique, and synthesise the literature on a research topic in a way that enables new theoretical frameworks and perspectives to emerge.

Most integrative literature reviews aim to address either older and established subjects or emerging subjects. When dealing with established subjects, employing an integrative review method provides an overview of the existing knowledge, conducts a critical assessment that may lead to re-conceptualisation, and augments the theoretical framework of the specific topic as it progresses. In the case of emerging subjects, the purpose is primarily to develop initial or preliminary conceptualisations and theoretical models instead of reviewing pre-existing models. This form of review often necessitates a more imaginative gathering of data, as the objective typically involves combining perspectives and insights from various disciplines or research traditions rather than encompassing all articles ever published on the subject. Integrative literature reviews are a versatile and rigorous form of research that aim to synthesise and critically analyse the existing body of knowledge on a particular topic (Torraco, 2005). Unlike traditional narrative reviews, which often merely summarise the literature, integrative reviews strive to generate new insights and perspectives by systematically analysing, critiquing, and integrating the findings from a wide range of studies (Alsalami, 2022; Torraco, 2005).

2.1 Steps in the process

Conducting an integrative literature review typically involves several key steps. First, the researcher must identify an appropriate topic or issue that would benefit from a comprehensive literature synthesis (Torraco, 2005). Once the topic is selected, the researcher

must justify why a literature review is the most suitable approach for addressing the research question or problem (Torraco, 2005). Next, the researcher must thoroughly search and retrieve the relevant literature, ensuring the search is comprehensive and systematic (Torraco, 2005). The Boolean search method can be applied. This step is crucial, as the quality and breadth of the literature included in the review will directly impact the validity and generalisability of the findings (Torraco, 2005). An initial search found 71 articles.

After gathering the relevant literature, the researcher must critically analyse and evaluate the existing research, identifying patterns, trends, and gaps in the knowledge base (Alsalami, 2022; Torraco, 2005). This analysis serves as the foundation for the subsequent synthesis, where the researcher aims to create new understandings of the topic by integrating and interpreting the findings from multiple studies (Torraco, 2005).

To source articles, an Emerald, EBSCOhost, and Google Scholar search was done. The opinions and definitions of the different researchers were synthesised to contribute to an overview of the existing body of knowledge and conceptualise a possible contribution to existing theory regarding micro-credentials to broaden understanding and add perspectives.

2.2 Data analysis

The data analysis part of an integrative or critical review is not mainly developed according to a specific standard (Whittemore & Knafl, 2005). While there is no strict standard, the general aim of data analysis in an integrative review is to critically analyse and examine the literature and the main ideas and relationships of an issue. Articles published were analysed to identify the progress and innovation happening in the academic research on micro-credentials over the last few years and explore the trend in which it is developing.

An integrative review method should advance knowledge and theoretical frameworks rather than provide an overview or description of a research area. The integrative literature review is a sophisticated form of research that requires a high degree of skill and insight (Torraco, 2005). Unlike other types of literature reviews, integrative reviews are expected to move beyond simply summarising the literature and instead offer valuable new perspectives and theoretical frameworks that can advance the field of study (Alsalami, 2022; Torraco, 2005). In this article, the review will use literature to pave the way for the future adoption of micro-credentials in higher education and lifelong learning.

3. Findings and Discussion

Higher education institutions (HEIs) increasingly focus on their students' employability skills as an integral part of their goals to improve their chances of entering the economic market. In parallel with this, the shift of focus from the recognition of conventional qualifications to micro-credentials has also emerged as a trend, which stems from a long-standing debate on the value of degrees for the future of work.

3.1 Theoretical framework

Since the authors are from South Africa, the Council on Higher Education provides the theoretical framework in which this study positions itself regarding offering micro-credentials by higher education institutions in South Africa as in Communique 2 of 2023. This framework states that micro-credentials are emerging globally as flexible and responsive learning opportunities. Many countries are integrating them into their education systems, though uptake varies widely. In Southern Africa, including South Africa, policy and strategy development around micro-credentials is in its early stages. National qualifications frameworks are still figuring out how to incorporate them despite some preliminary discussions and draft frameworks by various entities. Awareness among learners, employees, and employers is low. Significant barriers to access exist, such as limited internet access, devices, and social inequalities.

Key issues still to be considered are:

- Defining micro-credentials in the Southern African context;
- Registering micro-credentials on national qualifications frameworks;
- Deciding if micro-credentials should be credit-bearing;
- Enabling recognition of micro-credentials, especially in workplaces;
- Understanding the relationship between micro-credentials and full qualifications;
- Determining if stacking of micro-credentials towards qualifications should be allowed and under what criteria;
- Ensuring quality assurance and identifying responsible entities;
- Establishing a repository for micro-credentials; and
- Advancing social justice through access to and achievement of micro-credentials.

The Council on Higher Education, with partners, is initiating a project to develop a broad Southern African framework for micro-credential recognition, providing guidelines for individual countries and institutions. Higher education institutions that already offer micro-credentials should maintain quality and integrity. They are advised to develop institutional policies covering governance, design, delivery, approval, marketing, resources, assessment, certification, records management, and continuous improvement.

Current regulations only allow credits for learning that is part of a qualification. However, modules taken for non-degree purposes could be recognised as credit-bearing micro-credentials, potentially allowing recognition in formal qualifications through Credit Accumulation and Transfer (CAT) mechanisms. Other micro-credentials can be recognised through a Portfolio of Evidence for Recognition of Prior Learning (RPL) for access to or advanced standing in formal qualifications.

Given this theoretical framework by the Council on Higher Education, no policies are in place, and studies and discussions are still seeking the way forward. This framework indicates thus a current gap and an invitation to debate and contributions. This article and this integrative literature review aim to contribute to the debate on finding a pathway to how micro-credentialing can contribute to inclusive education and workforce development.

3.2 Overview of existing research on micro-credentials

After a literature search, the articles in table 1 were retrieved on 17 July 2024. Since these articles are viewed as data, they are not listed again as references in the reference list at the end of this article. Only those referred to in the article have been listed. The oldest article that could be found was published in 2014. The table oversees 71 articles published within the last ten years. Before COVID-19 was diagnosed and the lockdowns started, 32 articles were published in the preceding six years. Most articles, 33, were published when all learning activities moved online during the three years of 2021- 2023. COVID thus accelerated the shift towards digital learning and an innovative way of upskilling.

According to the data in table 1, exploratory research on micro-credentialing was conducted between 2014 and 2021. Scholars started reviewing and systemising the accumulated knowledge in 2021 with the study of Gish-Lieberman, Tawfik, and Gatewood, who published a historical overview of micro-credentials in education. Between 2022 and 2023, 11 reviews of the existing literature were published. This period coincides with the

COVID-19 pandemic, which indicates that micro-credentials became a significant and relevant topic. COVID-19 as an external factor accelerated interest in the topic. The sudden changes in the way of education, namely the move online, as well as the changes in job market demands, namely remote working and new skill sets, as well as the rapid technological advancements, ignited interest in the topic, and the research regarding micro-credentials gained momentum. It attracts more scholars at the moment. The fact that so many literature reviews saw the light also implies that a substantial body of knowledge exists at that stage that warrants synthesis and critical analysis.

Table 1
Articles published on micro-credentials

	Article title	Authors	Year	Citations	References
1	The use, role and reception of open badges as a method for formative and summative reward in two Massive Open Online Courses	Cross, S., Denise Whitelock, D., & Galley, R.	2014	26	29
2	Exploring the use of micro-credentialing and digital badges in learning environments to encourage motivation to learn and achieve	Clayton, J., Elliott, R., & Iwata, J.	2014	27	12
3	Developing Open Badges: A Comprehensive Approach	Devedzic, V., & Jovanović, J.	2015	91	51
4	A History and Frameworks of Digital Badges in Education	Ostashewski, N., & Reid, D.	2015	43	19
5	Micro-Credentials, Nano Degrees, and Digital Badges: New Credentials for Global Higher Education	Lemoine, P.A., & Richardson, M.	2015	62	50
6	Open badges: A best-practice framework	Voogt, L., Dow, L., & Dobson, S.	2016	1	66
7	Technology and Learning: Preparing Teachers for the Future	Lemoine, P.A. M., Yates, H., & Richardson, M.	2016	2	91
8	Challenges for adult skill formation in the globalising learning economy – a European perspective	Lundvall, B., & Rasmussen, P.	2016	23	44
9	Understanding digital badges in higher education through assessment	Abramovich, S.	2016	46	12
10	To what extent do discipline, knowledge domain and curriculum affect the feasibility of the Recognition of Prior Learning (RPL) in higher education?	Harris, J., & Wihak, C.	2017	19	37
11	Perceptions and Uses of Digital Badges for Professional Learning Development in Higher Education	Dyjur, P., & Lindstrom, G.	2017	64	20
12	The Emerging Formalization of MOOC Coursework: Rise of the MicroMasters	Caudill, J.	2017	11	0
13	The effect of perceived relevance of digital badges on student engagement	Higashi, R.M.	2018	1	116
14	Global Marketing of Higher Education	Mense, E.G., Garretson, C.,	2018	3	127

	Article title	Authors	Year	Citations	References
	E-Learning	Lemoine, P.A., & Richardson, M.			
15	Teachers' perceptions of digital badges as recognition of professional development	Jones, W.M., Hope, S., & Adams, B.	2018	30	20
16	Micro-credentialing in Mobile Learning: Implications for Impactful Design	Pechenkina, E.	2018	1	39
17	An exploration of the utility of digital badging in higher education settings	Carey, K., & Stefaniak, J.E.	2018	66	56
18	Digital badges, do they live up to the hype?	Roy, S., & Clark, D.	2018	22	44
19	A Learner-Centred Approach for Lifelong Learning Powered by the Blockchain	Mikroyannidis, A., Domingue, J., Bachler, M., & Quick, K.	2018	41	10
20	Goal Setting and Open Digital Badges in Higher Education	Cheng, Z., & Newby, W.T.	2018	41	49
21	Understanding the feasibility of micro-credentials in engineering education	Mischewski, B., & Christie, A.	2018	4	0
22	Marketing Micro-Credentials in Global Higher Education: Innovative Disruption	Lemoine, P.A., Wilson, W., & Richardson, M.	2018	7	64
23	Micro-credentials in higher education institutions: an exploratory study of its place in Tanzania	Ghasia, M., Machumu, H.J., & Smet, E.D.	2019	33	27
24	Micro-credentials: the potential of personalized professional development	Hunt, T.L., Carter, R., Zhang, L., & Yang, S.	2019	32	4
25	Decentralising online education using blockchain technology	Mikroyannidis, A., Third, A., & Domingue, J.	2019	14	9
26	The FAIR TRADE Framework for Assessing Decentralised Data Solutions	Domingue, J., Third, A., & Ramachandran, M.	2019	14	25
27	Creative Disruption in Higher Education	Lemoine, P.A., & Richardson, M.	2019	11	70
28	Instructional digital badges: effective learning tools	Newby, T., & Cheng, Z.	2019	23	52
29	Preparing students for university studies and beyond: a micro-credential trial that delivers academic integrity awareness	Ruddy, C., & Ponte, F.	2019	20	31
30	Instilling purpose and value in the implementation of digital badges in higher education	Stefaniak, J.E., & Carey, K.	2019	41	36
31	The use of Open Badges in library and information science education in Estonia	Virkus, S.	2019	6	33
32	Value of Open Microcredentials to Earners and Issuers	Young, D., West, R., & Nylin, T.A.	2019	14	31
33	The emergence of alternative credentials	Kato, S., Galán-Muros, V., & Weko, T.J.	2020	42	0
34	Microcredentialing of English Learner Teaching Skills: An Exploratory Study of Digital Badges as an Assessment Tool.	Purmensky, K., Xiong, Y., Nutta, J.W., Mihai, F., & Mendez, L.	2020	3	52
35	Getting Started With Open Badges and Open Microcredentials	Clements, K., West, R., Hunsaker, E.	2020	31	43
36	The use of Open Badges in library and	Askeroth, J., & Newby, T.	2020	5	64

	Article title	Authors	Year	Citations	References
	information science education in Estonia				
37	Guidelines for open and online learning assessment and recognition with reference to the National and European qualification framework: micro-credentials as a proposal for tuning and transparency	Trepule, E., Volungevičienė, A., Teresevicienė, M., Dauksienė, E., Greenspon, R., Tamoliūnė, G., Šadauskas, M., & Vaitonytė, G.	2021	2	20
38	Digital badges: Pinning down employer challenges	Perkins, J., & Pryor, M.	2021	17	0
39	Micro-Credentials and Badges in Education: a Historical Overview	Gish-Lieberman, J., Tawfik, A., & Gatewood, J.	2021	20	21
40	How and why are digital badges being used in higher education in New Zealand?	Hartnett, M.	2021	11	43
41	How to Increase the Value of Digital Badges for Assessment and Recognition in Higher Education. A University Case	Trepule, E., Volungevičienė, A., Teresevicienė, M., Greenspon, R., & Costa, N.	2021	5	42
42	A systematic literature review of micro-credentials in higher education: a non-zero-sum game	Ngoc, N.H.T., Spittle, M., & Van Dyke, A.M.	2022	13	61
43	Exploring the potential of micro-credentials: A systematic literature review	Tamoliūnė, G., Greenspon, R., Teresevicienė, M., Volungevičienė, A., Trepule, E., & Dauksienė, E.	2022	8	68
44	A strategic reset: micro-credentials for higher education leaders	McGreal, R., & Olcott, D.	2022	3	0
45	Unboxing micro-credentials: an inside, upside and downside view	Brown, M., & Nic-Giolla-Mhichil, M.	2022	19	50
46	Toward just and equitable micro-credentials: an Australian perspective	Desmarchelier, R., & Cary, L.J.	2022	22	33
47	Implementation of micro-credentials in higher education: A systematic literature review	Ahsan, K., Akbar, S., Kam, B., & Abdulrahman, M.	2022	7	98
48	Blockchain-based micro-credentialing system in higher education institutions: Systematic literature review	Alsobhi, H., Alakhtar, R.A., Ubaid, A., Hussain, O., & Hussain, F.	2022	25	33
49	Bridging the Gap: Micro-credentials for Development	McGreal, R., Mackintosh, W.G., Cox, G., & Olcott Jr, D.	2022	16	43
50	Micro-credentials for Social Mobility in Rural Postsecondary Communities: A Landscape Report	Tinsley, B., Cacicio, S., Shah, Z., Parker, D.P., Younge, O., & Luna, C.L.	2022	5	0
51	The International Case for Micro-Credentials for Life-Wide And Life-Long Learning: A Systematic Literature Review	Msweli, N.T., & Ismail, H.T.M.	2022	7	0
52	An assessment of micro-credentials in New Zealand vocational education	Fisher, R., & Leder, H.	2022	11	30
53	Features of Micro-credential Platforms in Higher Education	Kiiskilä, P., Hanafy, A., & Pirkkalainen, H.	2022	13	27
54	Harnessing the Benefits of Micro Credentials for Industry 4.0 and 5.0: Skills Training and Lifelong Learning	Shanahan, B.W. & Organ, J.	2022	4	4
55	The evolution of a micro-credential	Ponte, F., & Saray, F.	2022	5	16

	Article title	Authors	Year	Citations	References
56	Micro-credentials and reflections on higher education	Orman, R., Simsek, E., & Çakır, M.A.K.	2022	5	23
57	Micro-credentials in leveraging emergency remote teaching: the relationship between novice users' insights and identity in Malaysia	Kumar, J.A., Richard, R.J., Osman, S., & Lowrence, K.	2022	19	70
58	Exploring the potential of micro-credentials: A systematic literature review	Tamoliūnė, G., Greenspon, R., Teresevicienė, M., Volungevičienė, A., Trepule, E., & Dauksienė, E.	2023	8	68
59	Micro-credentials in digital form - lifelong development path	Nowakowski, M.	2023	0	0
60	A Strategic Institutional Response to Micro-Credentials: Key Questions for Educational Leaders	Brown, M., McGreal, R., & Peters, M.	2023	7	42
61	The Implementation of Micro-Credentials in Formal and Informal Learning: A Systematic Literature Review	Rajabalee, Y.	2023	0	50
62	A systematic review of the opportunities and challenges of micro-credentials for multiple stakeholders: learners, employers, higher education institutions and government	Varadarajan, S., Koh, J., & Daniel, B.	2023	21	95
63	Experiences with Micro-Credentials at UC3M: Academic and Technological Aspects	Hoyos, C.A., & Kloos, C.D.	2023	2	43
64	Micro-credentials and the role of evidence: increasing the potential for learner-centeredness, inclusivity and an expansive model of assessment and credentialing	Reed, A.	2023	3	38
65	Institute of Coding in Wales Digital Skills Bootcamps - A Model for Stackable Micro-credentials	Hopkins, C., Moller, F., & Robert, L.	2023	3	7
66	Using Skills Profiling to Enable Badges and Micro-Credentials to be Incorporated into Higher Education Courses	Ward, R.R., Crick, T., Davenport, J., Hanna, P., Hayes, A., Irons, A., Miller, K., Moller, F., Prickett, T., & Walters, J.	2023	11	95
67	'People have Started Calling Me an Expert': The Impact of Open University Microcredential Courses	Chandler, K., & Perryman, L.	2023	1	28
68	Making sense of the digital badging landscape in education and workplace settings: a scoping review of the empirical literature	Cumberland, D.M., Deckard, T.G., Kahle-Piasecki, L., Kerrick, S.A., Ellinger, A.D.	2023	2	65
69	Workforce upskilling: can universities meet the challenges of lifelong learning?	Lang, J.	2023	6	9
70	The Global Micro-credential Landscape: Charting a New Credential Ecology for Lifelong Learning	Brown, M., Mhichíl, M.N.G., Beirne, E., & Lochlainn, C.M.	2024	43	59
71	The State of Micro-Credentials Implementation and Practice in Australasian Higher Education	Selvaratnam, R., & Sankey, M.	2024	11	60

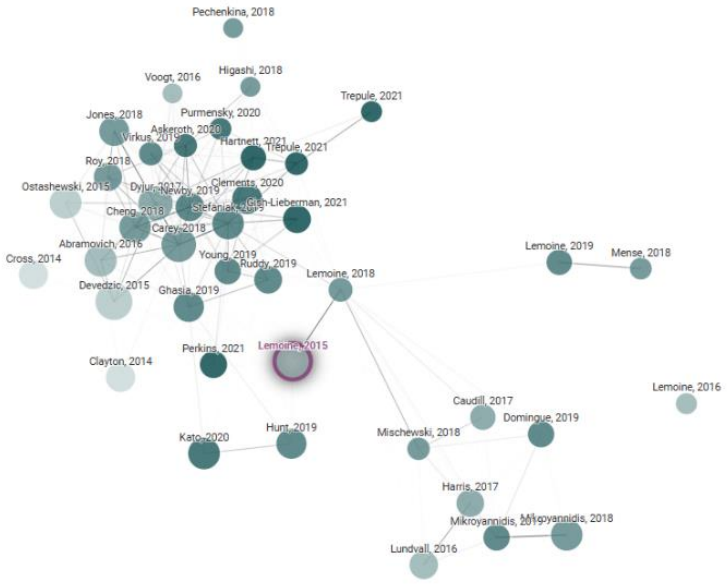
Literature reviews help to identify areas of consensus and divergence in a field. They also indicate that scholars try to understand and compare different perspectives, approaches, and findings.

3.3 Author map of published articles between 2014 and 2021

The map in figure 1 indicates the interdependency and development of the different sources discussing micro-credentials. According to the data in the map, the 2015 article by Lemoine and Richardson seems to have sparked interest in the field. The map indicates that all articles published, except for five, are linked in one way or another.

Figure 1

Author map



Source: AI-generated by connectedpapers.com

3.4 Micro-credentialing enhancing curricula, employability and lifelong learning

In today's rapidly evolving job market, micro-credentialing has become a valuable tool for individuals and institutions. Micro-credentials are small, targeted credentials that recognise specific skills or competencies, often in a shorter time frame compared to traditional academic degrees (McGreal et al., 2022). These credentials can provide significant benefits to both learners and organisations. Brown et al. (2021) explain micro-credentials as differentiated from traditional macro-credentials in the sense that it is non-status awards such

as short courses and nano-credentials such as digital badges or certificates, and, in many cases unbundled, credit-bearing, but stackable credentials. They explain it with the example of an individual learner who could have a non-credit-bearing badge in project management. This badge could be assessed as recognition of prior learning by a university or as part of a broader professional portfolio, which can contribute to a credit-bearing credential.

For learners, micro-credentials offer the opportunity to have their skills and competencies formally recognised, which can lead to enhanced employability and opportunities for career advancement (McGreal et al., 2022) in a context where more and more jobs are disappearing due to the automation of basic tasks, and where many new high-skill jobs are emerging (Hopkins & Moller, 2024). However, it is essential to note that micro-credentials alone do not guarantee career success; they are one form of employability capital and an adaptive career behaviour that individuals may use to pursue their goals (Healy, 2021). Learners can access learning on-demand at a lower cost and with more choices, particularly in areas where skills are in high demand (McGreal et al., 2022). They can also stack it and use it as a pathway to a more extensive or complete qualification (Brown et al., 2021).

From the institutional perspective, micro-credentials can serve as a new revenue stream by tapping into new markets while decreasing costs associated with traditional educational programs (McGreal et al., 2022). These shorter, focused units of study offer flexibility and can be integrated into existing curricula through blended learning approaches (Sharma et al., 2024). Furthermore, stronger connections with employers and professional bodies can lead to a better understanding of the marketplace's evolving needs, enabling institutions to tailor their offerings accordingly (McGreal et al., 2022). The Employability Skills Micro-credentialing methodology, tested in East African universities, demonstrates promise in fostering pedagogical innovation and improving the visibility of employability skills (Maina et al., 2022). According to Brown et al. (2021), it is currently complementary to a full qualification. At most universities, micro-credentials are part of larger programmes, where they are credit-bearing modules. These programmes were unbundled for micro-credentialing purposes. Attaching credits to standalone modules is a new concept in higher education. The existing system was not built or designed for this (Hopkins & Moller, 2024).

With the current growth in global population to about 8 billion people, of which 42% are under the age of 25, the traditional brick-and-mortar approach to education and traditional

credentialing through degree programmes at universities can impossibly meet the projected growing demand for higher education worldwide through traditional delivery models. Many in industry and academia argue for the disruption of higher education and the unbundling of traditional degrees to better recognise nano talents and bite-sized blocks of learning (Brown et al., 2021) that will be more relevant to the needs of society and the changing nature of work, as well as to accommodate personal circumstances of individuals, their lifestyle, financial possibilities, capabilities, personality and job and employment possibilities.

Employers also stand to benefit from the adoption of micro-credentialing. Micro-credentials allow employers to assess and certify applicants' specific skills and competencies, enabling more competency-based hiring practices (Gauthier, 2020). This can be particularly valuable as organisations seek to adapt to rapidly changing technologies and business processes (McGreal et al., 2022). Micro-credentials provide the option for employers and learners to access courses as and when needed, only addressing gaps in knowledge as and when discovered (Hopkins & Moller, 2024).

However, the rise of micro-credentialing is not without its challenges. Some scholars argue that micro-credentials may seek to change the supply of educational qualifications to address a labour demand problem, potentially diverting students from more substantial credentials with greater long-term value (Wheelahan & Moodie, 2021). Additionally, there are concerns that micro-credentials may further contribute to the privatisation and marketisation of higher education, potentially undermining its educational purposes. Despite these concerns, the potential benefits of micro-credentialing cannot be ignored. As the job market continues to evolve, micro-credentialing offers a flexible and targeted approach to skills development and recognition, with the potential to benefit learners, institutions, and employers alike (Gauthier, 2020; McGreal et al., 2022). According to a McKinsey Global Institute report, by 2030, about 14% of the workforce will need to switch occupational categories because of technological and other innovations (Brown et al., 2021). Around 85% of the jobs today’s learners will be doing in 2030 have not yet been invented. Over the next few years, the rapid evolution of technology will reshape millions of jobs. Together with this, the skills demand continues to change, and people will thus continually need to re-train, reskill or redeploy to avoid redundancy and social and economic displacement in their local communities.

To ensure the long-term value and validity of micro-credentials, institutions must develop robust governing rules and systems akin to those governing academic transcripts to ensure their integrity and transparency (Gauthier, 2020).

3.5 The impact of COVID-19 on digital learning and micro-credentialing

The COVID-19 pandemic has profoundly impacted the education landscape, catalysing a rapid shift towards digital learning and the increasing prominence of micro-credentialing. As traditional educational institutions scrambled to adapt to remote instruction, the need for robust digital infrastructure and pedagogical approaches has become increasingly apparent.

The flexibility and responsiveness of internet-based learning approaches have become critical in this disruption, enabling service providers and learners to meet real-time market demands and expectations (Suguku, 2023). This has been further reinforced by the growing digital savvy of millennial learners, who are more inclined to adopt online learning modalities (Suguku, 2023).

The pandemic has also highlighted the critical importance of digital literacy for educational and vocational success, overall wellness, and participation in an increasingly digital society (Murray et al., 2022). Those without digital skills have faced significant challenges in accessing essential services, maintaining social connections, and remaining informed, underscoring the need for comprehensive digital upskilling initiatives.

Higher education institutions have been compelled to undertake rapid digital transformation in response to these challenges, leveraging various technologies and platforms to sustain operations (Marks & Al-Ali, 2020). While this has exposed shortcomings in the digital readiness of many institutions, particularly in developing nations, it has also presented opportunities for innovation and collaboration (Mihovska et al., 2021).

One such innovation has been the rise of micro-credentialing, which offers flexible, targeted, and often industry-aligned learning opportunities that can be easily integrated into lifelong learning journeys. The pandemic has accelerated the adoption of micro-credentials as individuals seek to upskill and reskill in the face of economic disruption and changing labour market demands.

As the world navigates the long-term implications of the COVID-19 pandemic, the importance of digital learning and micro-credentialing will only continue to grow.

Governments, educational institutions, and employers must work collaboratively to address the digital skills gap, invest in robust digital infrastructure, and ensure that learners have access to the tools and resources they need to succeed in an increasingly digitised world (Taylor et al., 2018; McGreal & Olcott, 2022; Nyashanu et al., 2023).

3.6 Micro-credentialing in a global arena

Micro-credentialing has emerged as a significant phenomenon in the global educational landscape, offering a unique approach to skill development and recognition that complements traditional degree programs. This paradigm shift is driven by the growing realisation that traditional educational models, focused on seat time and degree attainment, do not always align with the dynamic needs of the modern workplace. From a global perspective, the United States, Europe, New Zealand, and Australia have taken the lead in supporting micro-credentials, particularly among universities and colleges (Rossiter & Tynan, 2019). This trend is not limited to these regions, as emerging developments are also occurring in Canada, Peru, Indonesia, Mexico, the United Arab Emirates, South Africa, Malaysia, and other parts of the world. In addition to this growth, there is increased interest and public commentary from government, higher education, and corporate leaders internationally, who recognise the potential of micro-credentials to address skills and competency gaps.

In Ireland, the Irish Universities Association has committed itself to developing a national micro-credential system for universities over the next few years to indicate where micro-credentials will fit into the national qualification framework. Australia, Canada and the Netherlands also indicated that they are on the brink of adopting uniform national approaches to micro-credentialing (Brown et al., 2021). Various models are also under review in the UK for incorporating micro-credentials into UK Higher Education (Hopkins & Moller, 2024).

Micro-credentials have been officially recognised and funded by the New Zealand Qualifications Authority since 2023. When a new micro-credential is submitted for accreditation, the approval process takes no more than six weeks. To qualify for funding, a micro-credential must meet the needs of industry or communities and align with government priorities. It must address a clearly defined industry or community need, focus on specific skills, and possess stand-alone value. Additionally, it must promote innovation and demonstrate clear benefits regarding employment outcomes or community impact. Micro-

credentials are awarded with a minimum of five credits and a maximum of 40 credits. They can be stackable and combined with other micro-credentials or learning experiences to contribute toward a larger qualification (TEO, 2023).

In India, micro-credentials have been aligned with the National Education Policy since 2020. This policy recognises the importance of skill-based competencies and the growing demand for micro-credentials. A national credit framework has been established, which serves as a comprehensive framework that integrates credits earned through school education, higher education, and vocational skills education. A Credit Bank has also been created, allowing students to open an Academic Bank of Credit account where they can store the credits earned from both macro-credentials and micro-credentials in digital form. One significant initiative is SWAYAM, which stands for Study Webs of Active Learning for Young Aspiring Minds (Singh, 2024). SWAYAM provides access to free online courses covering advanced education, high school subjects, and vocational skills. This platform supports the concept of micro-certificates and offers up to 2,000 courses.

In the United States, no federal framework universally defines or regulates micro-credentials. The U.S. has a decentralised education system, granting significant autonomy to states, institutions, and accrediting bodies. Some states have developed more advanced frameworks for micro-credentials than others. For example, New York has proactively integrated micro-credentials into its education system. California has also explored using micro-credentials within its community colleges and public universities to support workforce development. Texas has participated in several initiatives to incorporate micro-credentials into its higher education system and align them with industry needs. In some states, employers actively seek candidates with specific micro-credentials, while in others, traditional degrees and certifications may hold more significance (Ositelu et al., 2021).

The shift towards micro-credentialing is driven by the recognition that the traditional credentials continuum needs to be reconsidered, with a greater emphasis on unbundling the content and the credential itself. Employers increasingly seek ways to certify applicants' specific competencies rather than relying solely on traditional degree programs. Micro-credentials offer a mechanism for employees to articulate their competencies, providing employers with a more precise understanding of an individual's skills and abilities (Gauthier, 2020). High-profile companies such as EY, Google, and IBM have adopted a recruitment strategy that gives people an opportunity based on non-traditional education and soft skills

like grit, tenacity, and perseverance. Google wants to disrupt traditional education models by offering short courses that it will recognise as equivalent to a full bachelor's degree for recruitment purposes. In 2018, Google launched an Online IT support certificate through Coursera and created a consortium of more than 20 employers interested in hiring completers. More recently, Google launched its Career Certificates, which are designed to develop job-ready skills without people needing to attend a college or university. IBM offers badges to its staff and the broader public through its partnership with Coursera. They also partnered with the USA's Northwestern University to use IBM badges for professional master's degree programs. Amazon decided in 2019 to spend $700 million to retrain 100,000 of its employees outside the traditional education system using its credential programs. The EY badging system, launched in 2017, offers staff the opportunity to upskill by earning a badge in data visualisation, AI, data transformation, and information strategy. In 2020, the Trump administration signed an executive order emphasising skills rather than degrees in federal hiring. There is a growing belief that skills, rather than specific jobs or qualifications, will be more important in the future job market (Brown et al., 2021).

This shift in the educational landscape is not without its challenges, however. Micro-credentials have been criticised for seeking to change the supply of educational qualifications or credentials to solve a problem of demand for labour, potentially diverting students from substantial credentials with substantial value to micro-credentials with micro value (Wheelahan & Moodie, 2021). Additionally, there are concerns that micro-credentials may reorient higher education from educational to employment purposes, further extending the privatisation and marketisation of higher education (Wheelahan & Moodie, 2021).

3.7 Micro-credentialing in South Africa

Micro-credentialing is emerging as a flexible and innovative approach to education in South Africa. It offers potential benefits such as motivating learners, supporting lifelong learning, and addressing skills gaps (Crafford & Matthee, 2016; Jones, 2022). Micro-credentials provide time and financial flexibility, can be stacked into larger qualifications, and offer a broader range of transdisciplinary competencies (Sibiya & Nyembezi, 2018; Msweli et al., 2022). They are particularly relevant in the context of high dropout rates in traditional degree programs and the need for more accessible education options (Vakalisa, 2005; Dias & Posel, 2007). The traditional South African university degree programme –

spanning multiple years, premised on students having a solid educational foundation – is in dire need of a rethink in a country where 39% of university students in contact programmes fail to graduate within six years of initial enrolment and a shocking 80% of distance learners fail to do so within ten years. Such programmes often inadvertently reinforce the inequalities and injustices they are meant to overcome. Part of the problem is structural. A three- or four-year commitment to a singular form of recognition (a degree) in a context where so many students cannot reach the finish line is wasteful and punitive. The ironic result is that many students end up with debts for degrees they never obtained and nothing to show on their CVs for what they learned (Jones, 2022).

However, challenges exist, including a lack of understanding, resistance to change, and the need for standardisation and integration into existing systems (Crafford & Matthee, 2016; McGreal et al., 2022). Despite these obstacles, micro-credentials are a promising tool for bridging educational gaps, enhancing employability, and supporting lifelong learning in an increasingly digital world (McGreal et al., 2022; Msweli et al., 2022). To address this issue, the country is embarking on a joint effort by the Department of Education, Higher Education Institutions, and different non-governmental organisations to create a framework for micro-credentials and existing higher education qualifications to fit in and to support each other to the advantage and benefit of students, the world of work and institutions of higher learning.

One of the innovative thinkers in the South African context is the Northwest University in Potchefstroom (NWU). In February 2023, NWU established a framework for micro-credentials. The NWU defines a micro-credential as a course that is part of an existing module, where the module is part of an existing credit-bearing qualification. These learning components of courses can be stacked with other parts of a module coherently to award the full credit value of the module (NWU, 2024).

3.8 Potential of Micro-credentials in South Africa

Micro-credentials have the potential to provide adaptable and targeted learning opportunities that can be combined and aligned with industry standards. Since technology is taking over many manual jobs, employees must reskill or upskill themselves to re-enter the labour market (Tamoliūnė et al., 2023). It may provide an alternative to the one-size-fits-all approach that more education stakeholders wish to move away from in providing flexible

course offerings. Micro-credentials offer the flexibility, accessibility and affordability that learners increasingly require.

They can help to bridge the divide between traditional education and the evolving requirements of the job market. In higher education, micro-credentials have the potential to address challenges in traditional degree programs, particularly in South Africa, where graduation rates are low (Jones, 2022). They also have the potential to extend services in the assessment and recognition of non-formal and informal learning and introduce stackable credits (Tamoliūnė et al., 2023). A growing number of adults with either a higher education degree or lower will need to reskill and upskill through more flexible options than pursuing a full degree. Micro-credentials open the higher education market to those who previously thought they would not suit higher education or those who could not access it, thus addressing the social mobility problem affecting large communities (Hopkins & Moller, 2024). This is necessary to bridge the gap between the skills acquired from formal education and the evolving needs of the job market. Additionally, the COVID-19 crisis highlighted the need for more transparency in the available continuing education and training opportunities. It is becoming evident that the demand for online learning will persist. The value of flexible alternative credentials has been proven, as many working adults have enhanced their skills during the lockdown to better adapt to changes when the job market reopened (Brown et al., 2021).

With a high number of people owning cell phones and a tech-savvy younger generation, micro-credentials have the potential to offer a beneficial pathway for both education and career advancement in South Africa. They offer benefits such as flexibility, competency-based assessment, and cost-efficiency (Hunt et al., 2019).

3.9 Future of degrees and the role of micro-credentials in qualification scaffolding

Traditional university degrees are currently facing challenges from alternative forms of education. The job market increasingly emphasises specific skills, with many employers prioritising practical competencies over formal degrees. This shift is leading to a reassessment of the value of traditional university degrees. Some scholars believe that the importance of traditional degrees may diminish as the primary qualification for skilled professions in the future (Ralston, 2021). On the other hand, Masa and Timmis (2021) argue that university degrees will still be important, but for different reasons: They provide a solid

foundation for lifelong learning, offer opportunities to build stable networks, and allow individuals to associate with the brand of the university, thereby enhancing their personal branding. According to Coursera's CEO Jeff Maggioncalda (2023), in the future, universities will need to focus on attracting school-leavers to fill their campuses due to the increasing demand for the experience of leaving home, making friends, networking, meeting professors, gaining exposure, and obtaining an essential first qualification. Adult learners will learn through micro-credentials and online. Getting them on campus in the future will become increasingly difficult.

Micro-credentialing enables learners to customise their education based on personal interests and market demands, resulting in unique combinations of skills that closely align with specific career goals. This is particularly important in fields undergoing rapid technological advancement (Taylor et al., 2018; Caetano et al., 2023; Ward et al., 2023). By stacking micro-credentials, even from different institutions, based on interest, career advancement, employability, or marketability, students or lifelong learners can position themselves for a qualification if the collection of micro-credentials can be recognised and accredited by an institution or for a career opportunity. Stacking qualifications is gaining popularity as a more cost-effective and efficient approach to achieving educational and career objectives. For example, instead of pursuing a full degree, a student could complete a series of micro-credentials that collectively demonstrate expertise in a specific area, such as cybersecurity. This method reduces costs and allows for a more gradual and flexible learning path.

Educational institutions are beginning to recognise the potential of stackable credentials. Some universities have incorporated micro-credentials into their existing frameworks, enabling students to earn credits towards degrees while attaining industry-recognised qualifications. This integration can enhance the traditional education system by providing pathways for continuous learning and skill development, especially for those who may not have the time or resources to commit to a full degree program.

This trend is becoming more apparent with the increasing number of educational providers and platforms offering stackable credentials. These credentials allow learners to enhance their existing qualifications through targeted learning experiences. As a result, this fosters a more personalised educational journey that can lead to improved employability in a

dynamic job market (Taylor et al., 2018; Gehlhaus & Koslosky, 2022; Ward et al., 2023; Caetano et al., 2023).

It has not yet reached the point where a student can apply to a university to evaluate a collection of micro-credentials and receive a qualification, hopefully, in the near future. However, these micro-credentials are currently accepted in the Recognition of Prior Learning process, allowing students to be admitted to a qualification or receive exemptions for specific subjects within a qualification.

4. Conclusion

Micro-credentials offer a transformative approach to education, providing flexible and targeted learning pathways that align with industry demands. By bridging the gap between traditional education and workforce needs, they present a model for lifelong learning and enhanced employability. Higher education institutions must strategically integrate micro-credentials into their existing frameworks, ensuring quality assurance, credit recognition, and industry collaboration. Policymakers play a critical role in establishing regulatory frameworks that facilitate credential stacking across multiple institutions, fostering a system where learners can build personalised qualifications tailored to their career aspirations. The future of micro-credentialing lies in its ability to reshape higher education, making it more inclusive, responsive, and attuned to the dynamic global job market.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This work was not supported by any funding.

ORCID

Flip Schutte – https://orcid.org/0000-0001-6031-9206

Truida Oosthuizen – https://orcid.org/0000-0003-1093-255X

References

Alsalami, A I. (2022). Literature review as a key step in research processes: Case study of MA dissertations written on EFL of Saudi context. *Saudi Journal of Language Studies*, *2*(3), 153-169. https://doi.org/10.1108/sjls-04-2022-0044

Brown, M., Mhichil, M.N/G., Beirne, E., & Lochlainn, C. (2021). The global micro-credential landscape: Charting a new credential ecology for lifelong learning. *Journal of Learning for Development*, *28*(2), 228-254. https://doi.org/10.56059/jl4d.v8i2.525

Caetano, FJP., Casanova, D. & Moreira, D. (2023). Microcredentials: An opportunity towards the digital transformation. Conference paper: *Ninth International Conference on Higher Education Advances*. https://doi.org/10.4995/head23.2023.16125

Casadesus, M., Huertas, E., & Edo, C. (2023). A European perspective on accrediting short learning programs: First experiences are out. *Industry and Higher Education*, 37(3), 433-442. https://doi.org/10.1177/09504222221132129

Council on Higher Education. (2023). *Offering of micro-credentials by higher education institutions.* Communique 2 of 2023.

Crafford, R. & Matthee, M. (2016). Implementing open badges for recognition of learning achievements in South African organisations. *SAICSIT'16 Proceedings*, 12, 1-10. https://doi.org/10.1145/2987491.298750

Dias, R., & Posel, D. (2007). Unemployment, education and skills constraints in post-apartheid South Africa. *DPRU Working Paper No. 07/120*. https://doi.org/10.2139/ssrn.982046

Gauthier, T. (2020). The value of microcredentials: The employer's perspective. *The Journal of Competency-based Education*, *5*(2), e10209. https://doi.org/10.1002/cbe2.1209

Gehlhaus, D. & Koslosky, L. (2022). Training tomorrow's AI workforce: The latent potential of community and technical colleges. *Policy Brief for CSET*. https://doi.org/10.51593/20210022

Govender, K. & Singh, S. (2022). *Purpose centricity in the fifth industrial revolution.* Business Tech Africa.

https://www.businesstechafrica.co.za/features/2022/08/29/purpose-centricity-in-the-fifth-industrial-revolution/

Healy, M. (2021). Microcredential learners need quality careers and employability support. *Journal of Teaching and Learning for Graduate Employability*, *12*(1), 21-23. https://doi.org/10.21153/jtlge2021vol12no1art1071

Hopkins, C. & Moller, F. (2024). Institute of coding in Wales digital skills bootcamps – micro-credentials: A pilot project. *CEP '24: Proceedings of the 8th Conference on Computing Education Practice*. https://doi.org/10.1145/3633053.3633055

Hunt, T., Carter, R., Zhang, L. and Yang, S. (2020). Micro-credentials: The potential of personalized professional development. *Development and Learning in Organizations*, *34*(2), 33-35. https://doi.org/10.1108/DLO-09-2019-0215

Jones, B. (2022). *Microcredentials and digital badges: Opening higher education in south Africa through innovative recognition*. African Minda Publishers.

Lemoine, P. A., & Richardson, M. D. (2015). Micro-credentials, nano degrees, and digital badges: New credentials for global higher education. *International Journal of Technology and Educational Marketing*, 5(1). https://doi.org/10.4018/ijtem.2015010104

Kato, S., Galán-Muros, V., & Weko, T. (2020, March 16). *The emergence of alternative credentials.* OECD Education Working Papers, No. 216, OECD Publishing, Paris. https://doi.org/10.1787/b741f39e-en

Maggioncalda, J. (2023). *The future of colleges and universities*. Forbes TED talk with Diane Brady. https://www.youtube.com/watch?v=mUEp2KEKeJs

Maina, M.F., Ortiz, L.G., Mancini, F. & Melo, M.M. (2022). A micro-credentialing methodology for improved recognition of HE employability skills. *International Journal of Educational Technology in Higher Education*, 19(10), https://doi.org/10.1186/s41239-021-00315-5

Marks, A., & AL-Ali, M. (2020). Digital transformation in higher education: A framework for maturity assessment. *Science and Information Organization*, *11*(12). https://doi.org/10.14569/ijacsa.2020.0111261

Masa, A. & Timmis, D. (2021). *The future of skills in the age of automation.* IYF International Youth Foundation. https://www.youtube.com/watch?v=bL4QCzbnlAQ

McGreal, R., Mackintosh, W., Cox, G., & Olcott, D. (2022). *Bridging the gap: Micro-credentials for development. The International Review of Research in Open and Distributed Learning*, 23(3), 288–302. https://doi.org/10.19173/irrodl.v23i3.6696

McGreal, R., & Olcott, D. (2022, February 7). A strategic reset: Micro-credentials for higher education leaders. *Smart Learn. Environ*, 9, 9. https://doi.org/10.1186/s40561-022-00190-1

Mihovska, A., Prevedourou, D., Tsankova, Y., Manolova, A., & Poulkov, V. (2021). Building adaptive and inclusive education readiness through digital technologies. *2021 Joint International Conference on Digital Arts, Media and Technology with ECTI Northern Section Conference on Electrical, Electronics, Computer and Telecommunication Engineering, Cha-am, Thailand, 2021, pp. 384-388.* https://doi.org/10.1109/ectidamtncon51128.2021.9425728

Msweli, N.T., Twinomurinzi, & Ismail, M. (2022). The international case for micro-credentials for life-wide and life-long learning: A systematic literature review. *Interdisciplinary Journal of Information, Knowledge, and Management*, *17,* 151-190. https://doi.org/10.28945/4954

Murray, M., Pérez, J., & Fluker, J. (2022). Digital literacy in the core: The emerging higher education landscape. *Informing Science Institute*. https://doi.org/10.28945/4915

NWU. (2024). *Framework for micro-Credentials.* Northwest University. www.nwu.ac.za

Nyashanu, M., Mtambo, C M M., Karonga, T., & Walker, J. (2023). Exploring the impact of COVID-19 lockdown on learning among higher education students on the Copperbelt province, Zambia. *Cogent Education*, 10(1). https://doi.org/10.1080/2331186X.2023.2200631

Ositelu, M.O., McCann, C. & Laitinen, A. (2021). *The short-term credentials landscape.* newamerica.org/education-policy/reports/the-short-term-credentials-landscape/

Ralston, S.J. (2021). Higher education's microcredentialing craze: A postdigital-deweyan critique. *Postdigit Sci Educ*., *3*(1):83–101. https://doi.org/10.1007/s42438-020-00121-8

Rossiter, D., & Tynan, B. (2019). *Designing and implementing micro-credentials: A guide for practitioners*. Commonwealth of learning. http://oasis.col.org/handle/11599/3279

Sharma, H., Jain, V., Mogaji, E. and Babbilid, A.S. (2024). Blended learning and augmented employability: A multi-stakeholder perspective of the micro-credentialing ecosystem in higher education. *International Journal of Educational Management, 38*(4), 1021-1044. https://doi.org/10.1108/IJEM-12-2022-0497

Sibiya, A T., & Nyembezi, N. (2018). Examining factors that shape technical vocational education and training engineering students' understanding of their career choices. *International Journal of Research in Business and Social Science*, 13(5), 803. https://doi.org/10.4102/the.v3i0.33

Singh. S. (2024). *Micro credentials: An innovation in Indian higher education institutes*. Centre for Development Policy and Practice. https://www.cdpp.co.in/articles/micro-credentials-an-innovation-in-indian-higher-education-institutes

Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research, 104*(2019), 333-339. https://doi.org/10.1016/j.jbusres.2019.07.039

Suguku, D. (2023). Pillar of internationalization in higher education: The contribution of international collaborations and online delivery approaches to internationalization in HEIS. *EDP Sciences, 156,* 05004-05004. https://doi.org/10.1051/shsconf/202315605004

Tamoliune, G., Greenspon, R., Tereseviciene, M., Volungeviciene, A., Trepule, E. & Dauksiene, E. (2023). Exploring the potential of micro-credentials: A systematic literature review. *Frontiers in Education*, 7.1006811. https://doi.org/10.3389/feduc.2022.1006811

Taylor, A., Parrish, J., & Parks, R. (2018). *It's time to consider the benefits of Credential Engine.* The Successful Registrar, 18(9), 1-5. https://doi.org/10.1002/tsr.30523

Torraco, R J. (2005). Writing integrative literature reviews: Guidelines and examples. *Human Resource Development Review*, 4(3), 356-367. https://doi.org/10.1177/1534484305278283

Vakalisa, N C G. (2005). Unemployment in South Africa on the rise: Are schools and universities to blame? *Africa Education Review*, 2(1), 40–58. https://doi.org/10.1080/18146620508566290

Ward, R., Crick, T., Davenport, J H., Hanna, P., Hayes, A., Irons, A., Miller, K., Moller, F., Prickett, T. & Walters, J. (2023). Using skills profiling to enable badges and micro-credentials to be incorporated into higher education courses. *Journal of Interactive Media Education*, *1*(1). https://doi.org/10.5334/jime.807

Wheelahan, L., & Moodie, G. (2021). Gig qualifications for the gig economy: micro-credentials and the 'hungry mile'. *High Educ*, 83, 1279–1295. https://doi.org/10.1007/s10734-021-00742-3

Whittemore, R. & Knafl, K. (2005). The integrative review: Updated methodology. *Journal of Advanced Nursing*, 52, 546-553. 10.1111/j.1365-2648.2005.03621

Winberg, C., Engel-Hills, P., Rip, A., & Winberg, S. (2014). The ethics of curriculum development: Engineers and technicians in a context of development. *2014 IEEE International Symposium on Ethics in Science, Technology and Engineering*, Chicago, IL, USA, 2014, pp. 1-6. https://doi.org/10.1109/ethics.2014.6893429