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Consolidarea micro-credenţialelor prin intermediul alianţelor universitare europene: o abordare sistematică de cartografiere şi studiu de caz

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EMPOWERING MICRO-CREDENTIALS THROUGH EUROPEAN UNIVERSITIES ALLIANCES: A SYSTEMATIC MAPPING AND CASE STUDY APPROACH

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Abstract
In recent years, micro-credentials have emerged as one of the most significant innovations in European higher education, responding to increasing demands for flexible learning, lifelong upskilling, and stronger links between universities, the labour market, and societal needs. Understanding how these new learning formats are implemented is crucial for advancing both educational innovation and sustainable

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development. This study analyses how the 65 European Universities Alliances integrate micro-credentials to enhance curriculum flexibility, employability, and sustainability in higher education, while also exploring their alignment with SDG 4 and SDG 8 and addressing challenges in recognition, governance, and policy coherence. A comparative analysis is conducted using document analysis and systematic mapping of institutional frameworks, models, and strategic priorities. A structured evaluation matrix assesses micro-credential adoption based on modular learning pathways, cross-institutional recognition, and labour market integration across alliances. Micro-credentials are here to stay and are increasingly embedded in the strategic and educational approaches of alliances. They play a significant role in lifelong learning, student mobility, and workforce adaptability, yet implementation still face challenges due to regulatory misalignment, quality assurance gaps, and employer scepticism. The study relies on publicly available documents and information within a specific timeframe, which may not capture the most recent institutional developments. The findings indicate that micro-credentials are becoming an increasingly clear priority within the strategies and initiatives of the European Universities Alliances, being integrated in diverse forms and institutional approaches. A major strength of the study is that it represents one of the first comparative analyses across all 65 alliances, providing a comprehensive overview of how micro-credentials are conceptualised and implemented, as well as a strategic roadmap for institutional and policy innovation within the European Higher Education Area (EHEA). Nevertheless, standardisation and cross-border recognition remain critical challenges, alongside the study's reliance on publicly available documents within a specific timeframe, which limits the capture of more recent institutional developments. Future research should integrate empirical data from institutional leaders, policymakers, and employers to assess long-term adoption and impact, and further explore how micro-credentials may expand access to education and support digital and sustainability transitions.

Keywords: European Universities Alliances, higher education, micro-credentials, sustainable development goals, transnational education.

Rezumat

În ultimii ani, micro-certificările au devenit una dintre cele mai semnificative inovaţii din învăţământul superior european, răspunzând cererii tot mai mari pentru învăţare flexibilă, formare continuă pe tot parcursul vieţii şi legături mai puternice între universităţi, piaţa muncii şi nevoile societale. Înţelegerea modului în care aceste noi formate educaţionale sunt implementate este esenţială pentru avansarea transformărilor educaţionale şi a dezvoltării durabile. Acest studiu analizează modul în care cele 65 de Alianţe Europene de Universităţi integrează

micro-certificările pentru a creşte flexibilitatea curriculară, angajabilitatea şi sustenabilitatea în învăţământul superior, explorând în acelaşi timp alinierea acestora la Obiectivele de Dezvoltare Durabilă (ODD) 4 şi 8 şi abordând provocările privind recunoaşterea, guvernanţa şi coerenţa politicilor. O analiză comparativă este realizată prin analiza documentelor şi cartografierea sistematică a cadrelor instituţionale, modelelor şi priorităţilor strategice. O matrice de evaluare structurată analizează adoptarea micro-certificărilor prin intermediul parcursurilor modulare de învăţare, recunoaşterii interinstituţionale şi integrării acestora pe piaţa muncii în cadrul alianţelor. Micro-certificările sunt aici pentru a rămâne şi sunt tot mai mult integrate în abordările strategice şi educaţionale ale alianţelor. Ele joacă un rol semnificativ în învăţarea pe tot parcursul vieţii, mobilitatea studenţilor şi adaptabilitatea forţei de muncă, însă implementarea se confruntă încă cu provocări din cauza nealinierii reglementărilor, a lacunelor în asigurarea calităţii şi a scepticismului angajatorilor. Studiul se bazează pe documente şi informaţii disponibile public într-un interval de timp specific, care pot să nu surprindă cele mai recente evoluţii instituţionale. Rezultatele obţinute arată că micro-certificările reprezintă o prioritate tot mai prezentă în strategiile şi iniţiativele Alianţelor Europene de Universităţi, acestea fiind integrate într-o varietate de forme şi abordări instituţionale. Un punct forte al studiului este faptul că reprezintă una dintre primele analize comparative asupra tuturor celor 65 de alianţe, oferind o imagine de ansamblu asupra modului în care micro-certificările sunt conceptualizate şi implementate, precum şi o foaie de parcurs strategică pentru inovarea instituţională şi a politicilor în cadrul Spaţiului European al Învăţământului Superior (SEÎS). Totuşi, standardizarea şi recunoaşterea transfrontalieră rămân provocări esenţiale, la fel ca şi dependenţa de documente publice disponibile într-un interval de timp specific, ceea ce limitează surprinderea celor mai recente evoluţii. Cercetările viitoare ar trebui să integreze date empirice de la lideri instituţionali, factori de decizie şi angajatori pentru a evalua adoptarea şi impactul pe termen lung, precum şi să investigheze modul în care micro-certificările pot extinde accesul la educaţie şi pot sprijini tranziţiile digitale şi cele spre sustenabilitate.

***Cuvinte-cheie**: Alianţe Europene de Universităţi, educaţie transnaţională, învăţământ superior, micro-certificări, obiective de dezvoltare durabilă.*

1. Introduction

European higher education faces a rapid transformation process, aligned with a higher demand for flexibility, lifelong learning opportunities, and a stronger connection with the labour market and societal challenges. Throughout this transformation, micro-credentials have emerged as a key innovation, providing short, competency-based learning experiences that address skills gaps, support professional mobility, and expand access to education. More than traditional degree programmes, micro-credentials allow for modular learning, enabling learners to stack smaller learning units into recognised qualifications or use them as standalone certifications. This shift aligns with the *European Skills Agenda*, the *Digital Education Action Plan*, and broader policy frameworks designed to modernise learning in response to digitalisation and green transitions.

Among the institutions experimenting with micro-credentials are European Universities Alliances, created under the *European Universities Initiative (EUI)* to foster cross-border collaboration and innovation in higher education. These alliances are at the forefront of testing new models for integrating micro-credentials into degree structures, developing digital credentialing systems, and facilitating international recognition of learning. However, their engagement with micro-credentials is neither uniform nor fully understood. While some alliances have made significant progress in embedding micro-credentials within their programmes, others face challenges related to institutional resistance, regulatory fragmentation, and inconsistent employer recognition. Despite strong policy momentum, questions remain about the scalability, impact, and sustainability of micro-credentials in European higher education.

An important but underexplored aspect of this development is the relationship between micro-credentials and sustainability goals, particularly within the framework of the *United Nations Sustainable Development Goals (SDGs)* (United Nations, 2015). Higher education plays a crucial role in supporting SDG 4 (Quality Education) by promoting accessible and inclusive learning, as well as SDG 8 (Decent Work and Economic Growth) by equipping individuals with the skills needed for a changing labour market. Positioned

as ways to achieve such goals, micro-credentials seem to further enhance accessibility, workforce adaptability, while expanding lifelong learning opportunities. However, their actual role in supporting sustainable education and alternative learning and professional development pathways must still be further explored, especially in connection with the European Universities Initiative.

The debate on micro-credentials is still under balance between policy-driven approaches and empirical analyses, while the latter is still limited and requires further research and exploration. This is where analysing how European Universities Alliances approach micro-credentials can further show different models and strategies, moving the focus from broad policy and regulatory frameworks to practical implementation and impact analyses. This is where connections between micro-credentials and sustainable approaches to education can further investigate the achievement of SDG-related goals in European higher education.

This study seeks to explore these issues by examining the presence of micro-credentials within European Universities Alliances and assessing how they contribute to curriculum flexibility, student mobility, and workforce development. Rather than assuming a unified or standardised approach, the research aims to investigate the diversity of strategies, challenges, and models shaping the micro-credential landscape across alliances. By analysing these dynamics, the study contributes to a better understanding of how micro-credentials are being used, whether they are effectively supporting SDG 4 and SDG 8, and what factors influence their adoption and scalability.

To develop this analysis, the paper provides a theoretical and policy background, outlining the conceptual foundations of micro-credentials, their role in modular learning, and their connections to sustainable development. The methodology details the research design, including data collection strategies and analytical frameworks for examining micro-credential implementation across alliances. The findings and discussion present empirical insights into how alliances are integrating micro-credentials, highlighting common patterns, institutional barriers and challenges, aiming to provide some potential recommendations to diverse actors in European higher education: policy makers, practitioners and researchers alike.

2. Theoretical and policy background

Micro-credentials emerged as one of the key policy priorities within the *European Higher Education Area (EHEA)*, aiming to further enhance flexibility, upskilling and reskilling, as well as labour market cooperation withing higher education (Bozkurt & Brown, 2022; European Commission et al., 2020). Micro-credentials are defined as small, competency-based learning units, suitable to certify short learning experiences that provide learners with various backgrounds and needs with specific skills, either as standalone certifications or stackable building blocks for larger educational qualifications and degrees, aiming to increase portability and recognition at transnational level (Brown et al., 2021; Carţiş et al., 2023). Strongly linked with other European policy areas such as lifelong learning, digital competencies, and the recent *Union of Skills* (European Commission, 2025), micro-credentials aim to further align higher education with a dynamic and challenging labour market and societal environment.

2.1. Micro-credentials in the EHEA

Micro-credentials have become prominent in European higher education, offering brief, competency-based learning experiences targeting specific skills. Their adoption supports European policy goals on lifelong learning, employability, and accessibility (Bozkurt & Brown, 2022; European Commission et al., 2020). Defined by the European Commission as certified outcomes from short educational units, micro-credentials aim for standardised recognition across borders through transparent assessment and quality assurance (Brown et al., 2021). Although no globally accepted definition exists, the European educational systems have actively integrated micro-credentials into the *European Qualifications Framework (EQF)*, the *European Credit Transfer and Accumulation System (ECTS)*, and the *Bologna Process* (Antonaci et al., 2021; Berkling et al., 2023). This aligns with broader shifts toward modular, stackable learning pathways driven by digital transformation (Iucu & Carţiş, 2024).

Distinct from traditional qualifications, micro-credentials are shorter, specialised, often digitally delivered, and stackable, allowing learners to build towards formal degrees. The European approach emphasises rigorous

assessment and quality assurance, addressing skill gaps, workforce needs, and improving educational access (European Commission et al., 2020). Integration within European higher education is linked to the EHEA, *European Skills Agenda*, and *Bologna Process*. European Universities Alliances actively pilot micro-credentials to embed them in traditional degrees and enhance cross-national recognition (Brown et al., 2021).

Despite their potential, micro-credentials face challenges around standardisation, recognition, and regulatory coherence. European Commission guidelines exist, yet national policies vary significantly, affecting recognition in *National Qualifications Frameworks (NQFs)* (Rashkevych & Semigina, 2024). Employer uncertainty regarding their value further complicates implementation (Wheelahan & Moodie, 2021). Quality assurance remains another key challenge due to absent universal accreditation standards, potentially undermining credibility (Kušić et al., 2022). Institutions must therefore establish rigorous assessment mechanisms aligning with academic and professional standards (Ghasia et al., 2019). Concerns persist regarding the potential fragmentation of higher education, as micro-credentials may prioritise market-driven skills over holistic, interdisciplinary education (Wheelahan & Moodie, 2021). Hence, coherent policies are required to integrate micro-credentials effectively within traditional frameworks (Ling & Ling, 2023).

Successful implementation depends on institutional readiness, including digital infrastructure, curriculum redesign, and faculty training (Hänisch et al., 2024). Institutions must balance innovation with existing structures, ensuring micro-credentials enhance rather than disrupt established educational models (Antonaci et al., 2021). Future developments in micro-credentials will depend on scalability, recognition, and integration. Continued collaboration within alliances could solidify their role in lifelong learning and workforce development. Further research should focus on embedding micro-credentials within degree programmes, alignment with labour market needs, and supporting digital and sustainable transitions (Bideau & Kearns, 2022). Ultimately, the effective evolution of micro-credentials requires sustained cooperation among policymakers, higher education institutions, and labour market stakeholders to build cohesive, transparent, and internationally recognised frameworks supporting academic and professional development.

2.2. Curriculum flexibility and modular learning

European higher education is increasingly shifting towards curriculum flexibility, aiming to adapt traditional degree structures to diverse student needs and dynamic labour market demands. *Modular learning is central to this shift*, breaking down programmes into smaller, stackable units, allowing learners to tailor their education progressively (Berkling et al., 2023; European Commission et al., 2020). Micro-credentials significantly contribute to this evolving landscape, offering ***concise, competency-focused learning units*** that can *stand alone* or *aggregate into larger qualifications* (Pirkkalainen et al., 2022). Their importance is emphasised in European policy frameworks such as the *European Skills Agenda*, which advocate modular education to support lifelong learning and career adaptability (European Commission et al., 2020), as well as the most recent *Union of Skills* (European Commission, 2025). Incorporating micro-credentials within degrees enables institutions to create inclusive and flexible learning environments suitable for traditional students and professionals alike (Kušić et al., 2022).

This *modular approach* responds directly to the limitations of traditional degrees in addressing the changing needs of learners and industries (Bideau & Kearns, 2022). By offering modular courses, universities provide students greater autonomy, allowing them to select credentials aligned with their professional goals while ensuring recognition within broader qualifications frameworks (Bozkurt & Brown, 2022). Alliances have pioneered modular learning initiatives, such as *Blended Intensive Programmes (BIPs)*, as *short, hybrid experiences* that foster internationalisation, enabling students to earn transferable micro-credentials (Thiriet et al., 2012). *Stackability*, the ability to accumulate micro-credentials towards higher qualifications, bridges short-term skill development with long-term educational objectives, supporting continuous engagement in education (Rajabalee, 2023).

Modular structures notably enhance student mobility, lifelong learning, and interdisciplinary education (Berkling et al., 2023). Seamless credit transfer facilitates international experiences through programmes like Erasmus+ and digital platforms, broadening access to global learning opportunities (Onorati et al., 2017; Thiriet et al., 2012). For lifelong learners, modular education provides accessible pathways to rapidly acquire new competencies,

particularly crucial in rapidly evolving fields like digital technologies, sustainability, and artificial intelligence (Kušić et al., 2022; Pirkkalainen et al., 2022). Additionally, modular flexible learning arrangements encourage interdisciplinary learning, preparing students to address complex global challenges through integrated knowledge and collaborative problem-solving (Bideau & Kearns, 2022; Krause & Arnold, 2018).

Despite its potential, modular learning faces notable challenges. *Institutional resistance to change*, *concerns over academic coherence*, *workload*, and *credit allocation* hinder wider adoption (Hänisch et al., 2024; Kušić et al., 2022). *Regulatory and accreditation frameworks* lag behind, causing inconsistencies in micro-credential recognition across national systems (Bozkurt & Brown, 2022). Moreover, the *lack of robust digital infrastructures* complicates scalable implementation (Durak & Çankaya, 2025; European Commission et al., 2020). *Stakeholder engagement*, especially employer recognition of micro-credentials, remains another key challenge. Employers often prefer traditional qualifications, requiring universities to strengthen collaboration with industry to align micro-credentials closely with labour market demands (Varadarajan et al., 2023).

2.3. Micro-credentials and SDGs

Higher education institutions are increasingly integrating SDGs into their strategies, leveraging micro-credentials to advance goals such as those emerging from SDG 4 and SDG 8 (United Nations, 2015). Micro-credentials support lifelong learning, skill development, and inclusive education pathways, addressing demands for rapid upskilling, reskilling, and sustainable labour market transitions (Bozkurt & Brown, 2022; Brown et al., 2021; European Commission et al., 2020; McGreal et al., 2022).

Micro-credentials significantly contribute to SDG 4 by removing traditional barriers to higher education. They offer flexible, shorter learning experiences, enabling broader participation among working professionals, disadvantaged groups, and individuals with caregiving responsibilities (Rajabalee, 2023). Additionally, micro-credentials facilitate the *recognition of prior learning*, validating informal and experiential knowledge, thus enhancing educational

accessibility and relevance (Durak & Çankaya, 2025; Pirkkalainen et al., 2022; Rooy, 2004). Institutions also leverage micro-credentials to foster pedagogical innovation through interdisciplinary and challenge-based learning, preparing students to address sustainability challenges effectively (Bideau & Kearns, 2022).

Aligned with SDG 8, micro-credentials directly contribute to workforce development and economic growth, particularly in industries undergoing technological and sustainability transformations (McGreal et al., 2022). Collaborations between educational institutions and employers ensure micro-credentials should reflect current labour market demands, particularly in fields such as digital technologies, artificial intelligence, sustainable energy, and environmental management (Bozkurt & Brown, 2022; Durak & Çankaya, 2025; Rajabalee, 2023). These credentials also promote economic inclusion, providing accessible and cost-effective pathways for underrepresented groups and mid-career professionals to enhance employability and career adaptability (Datta et al., 2024).

Moreover, micro-credentials support entrepreneurship and self-employment by offering targeted skills relevant to independent work and start-up ventures, especially within the gig economy and digital innovation sectors (Keniry, 2020; Pirkkalainen et al., 2022). Despite their benefits, significant challenges remain regarding employer recognition, quality assurance, and standardised accreditation frameworks. Strengthening employer collaboration, accreditation standards, and cross-institutional recognition mechanisms is crucial for enhancing stakeholder trust (Varadarajan et al., 2023).

To fully harness micro-credentials' potential for sustainable development, institutions and policymakers must address issues related to quality assurance, credential portability, and policy harmonisation (European Commission et al., 2020; McGreal et al., 2022). Initiatives such as the *European Digital Credentials for Learning (EDCL)* have made strides, yet greater consistency across national frameworks is needed (Nomden & Jambon, 2022).

Future policies should further emphasise micro-credentials' roles in supporting the green and digital transitions, addressing skills shortages in sustainability, digital literacy, and emerging technologies (Bideau & Kearns, 2022). Additional research should focus on integrating micro-credentials within

broader national and European policies, linking them explicitly to SDGs beyond education and employment, including industry innovation, reducing inequalities, and climate action. By embedding sustainability competencies within micro-credentials, higher education institutions can actively contribute to building a resilient, inclusive, and adaptable workforce aligned with economic, social, and environmental goals.

3. Methodology

This study investigates how European Universities Alliances integrate micro-credentials into their educational strategies and practices, examining their inclusion in strategic documents, curricular structures, recognition and mobility frameworks, and partnerships with labour market actors, with a particular focus on contributions to SDG 4 and SDG 8. Given the exploratory aims of the study, *a qualitative multiple-case study approach* was selected. This design enables an in-depth examination of the diverse strategies, governance structures, and policies employed by different alliances when implementing and scaling micro-credentials.

We collected data primarily through *document analysis*, complemented by *systematic mapping of micro-credential initiatives* across the alliances. Additionally, we used an *analytical framework* to identify patterns in implementation, governance practices, and alignment with sustainability and workforce development goals. This combination of qualitative techniques provides a detailed exploration of institutional contexts and highlights best practices and common challenges in the adoption of micro-credentials.

The research is guided by four key questions:

1. How are European Universities Alliances engaging with micro-credentials in relation to SDG 4 (Quality Education) and SDG 8 (Decent Work and Economic Growth)?
2. What strategic priorities guide and shape the approaches of these alliances towards micro-credential development and implementation?
3. In what ways are alliances implementing micro-credentials to support curriculum flexibility, student mobility, and lifelong learning in alignment with SDG 4 and SDG 8?

4. What models, policy frameworks, and institutional factors influence the scalability and sustainability of micro-credentials within alliances?

The methodology follows a structured but flexible process to provide a holistic and comparative analysis. We begin with a mapping exercise to document existing micro-credential approaches within alliances. This is followed by the development of an analysis matrix, designed to categorise alliances based on their approaches to micro-credential adoption, their alignment with SDG priorities, and their institutional structures. Finally, we applied the matrix across all 65 alliances to generate comparative insights and identify common challenges and emerging trends in micro-credential implementation.

3.1. Research approach

For the present study, we used a *qualitative research design* to gain an in-depth understanding of different institutional strategies, policies, and approaches related to micro-credentials among the European Universities Alliances. Due to the complexities and nuances of diverse institutional practices and strategic approaches, a qualitative approach was considered most appropriate. Accordingly, we employed *a multiple-case study methodology* (Yin, 2018), which is particularly suitable for exploring phenomena across several bounded cases in order to capture both variation and commonalities. Each alliance was considered a separate case, defined by its institutional structures, strategic priorities, and educational practices. This methodological choice allowed us to compare how micro-credentials are conceptualised and implemented across different alliances, while also identifying patterns, best practices, and barriers. The use of multiple cases increases the robustness of the findings through replication logic, as it enables contrasts between diverse institutional contexts rather than reliance on a single model or framework. In this way, the study offers a comparative perspective that highlights both the specificities of individual alliances and the emerging trends that cut across the European Universities Initiative as a whole.

3.2. Data collection methods

We used *document analysis* (Bowen, 2009) and *systematic mapping* (Enders & De Boer, 2009) to examine micro-credential initiatives within European Universities Alliances. Document analysis serves as an effective tool for investigating policy documents, institutional reports, and publicly available resources to understand alliances' conceptualisation and implementation strategies for micro-credentials. The systematic mapping complemented this analysis by offering a structured approach to evaluating the scope and depth of micro-credential integration across different alliances, highlighting institutional commitments, programme designs, and policy orientations.

We started the data collection with a thorough review of publicly accessible alliance materials, including policy reports, institutional documents, programme outlines, alliance websites, frameworks, and event documentation explicitly related to micro-credentials. Following this initial review, we conducted a systematic mapping process for all 65 alliances (between October 2024 and January 2025), assessing the existence, scale, and structure of micro-credential offerings. This involved determining whether micro-credentials are integrated into degree programmes, provided as independent certifications, or co-developed with labour market partners. Additionally, we assessed the explicit alignment of micro-credential initiatives with SDG 4 and SDG 8, examining whether alliances directly reference sustainability and employability objectives within their educational strategies.

3.3. Development and application of the analysis matrix

Following the initial mapping of micro-credential initiatives across alliances, we elaborated *a structured analysis matrix* (presented by Table no. 1) to categorise alliances based on essential dimensions of micro-credential implementation, institutional structures, policy alignment, and encountered challenges. The matrix enables systematic comparative analysis, moving beyond mere descriptive mapping to identify effective practices, emerging trends, and critical implementation barriers.

Development of the analysis matrix is guided by established European policy frameworks, notably the *European Approach to Micro-Credentials* (European Commission et al., 2020), modular learning initiatives, and lifelong learning strategies. These frameworks serve as foundational references, while the matrix remains adaptable to capture institutional diversity and emerging approaches. Each dimension within the matrix corresponds to critical aspects of micro-credential adoption, facilitating classification based on institutional engagement, operational models, and policy integration.

The matrix comprises *seven key dimensions*. The *first dimension* assesses strategic integration, examining whether micro-credentials are fully embedded within degree programmes, employer-driven, or standalone offerings. The *second dimension* focuses on curriculum and learning pathways, specifically addressing modularity, stackability, and student mobility. *Dimensions three* and *four* explore alignment with SDG 4 and SDG 8, respectively, determining whether alliances explicitly or implicitly integrate these goals within their micro-credential strategies. The *fifth dimension* addresses different mechanisms, including accreditation through EQF, ECTS, or professional recognition, thus affecting micro-credential portability and acceptance beyond issuing institutions. Institutional challenges and barriers constitute the *sixth dimension*, examining factors such as internal resistance, financial constraints, and regulatory barriers impeding wider adoption. Finally, the *seventh dimension* explores future directions, analysing alliances' strategies to broaden micro-credential offerings, improve recognition across institutions, or enhance labour market relevance.

Each dimension utilises predefined indicators and coding categories, ensuring consistency and comparability across all 65 alliances. This structured application of the matrix facilitates detailed comparative analyses, revealing patterns in governance, notable trends, and key obstacles to comprehensive micro-credential adoption.

Table no. 1. *Dimensions and indicators for micro-credential implementation in European Universities Alliances*

Matrix dimensions	Codes	Indicators
Strategic integration	SI1 – Fully integrated	Micro-credentials are systematically embedded into degree structures and institutional strategies.
	SI2 – Pilot stage	Micro-credentials are in the experimental phase, with limited institutional adoption.
	SI3 – Standalone micro-credentials	Micro-credentials exist independently of degree programmes and are offered as separate certifications.
	SI4 – Embedded in degree pathways	Micro-credentials are formally included in undergraduate or postgraduate curricula.
	SI5 – Employer-driven model	Micro-credentials are developed primarily in collaboration with labour market or employers.
	SI6 – Cross-institutional recognition	Micro-credentials are recognised across multiple universities within an alliance.
Curriculum & learning pathways	CL1 – Stackable modules	Micro-credentials can be accumulated towards larger qualifications, such as degrees.
	CL2 – Standalone offerings	Micro-credentials are offered independently without being linked to broader qualifications.
	CL3 – Blended learning	Micro-credentials are delivered in a mix of online and in-person formats.
	CL4 – Interdisciplinary approach	Micro-credentials integrate knowledge from multiple disciplines or sectors.
	CL5 – Flexible learning pathways	Learners can take micro-credentials at different career and education stages.
	CL6 – Student mobility integration	Micro-credentials facilitate mobility between institutions, such as Erasmus+ or alliance-wide recognition.
SDG 4 alignment	SD4-1 – Explicit policy commitment	Micro-credentials are explicitly referenced as a tool for improving education accessibility and quality.
	SD4-2 – Partial alignment	Micro-credentials support SDG 4 goals but are not a primary institutional focus.
	SD4-3 – Indirect alignment	Micro-credentials contribute to SDG 4 but are not explicitly framed within this goal.
	SD4-4 – Focus on digital inclusion	Micro-credentials aim to reduce digital divides and increase access to online learning.
	SD4-5 – Linked to lifelong learning	Micro-credentials are part of lifelong learning policies within alliances.
SDG 8 alignment	SD8-1 – Workforce reskilling	Micro-credentials are designed to help workers transition into new industries.
	SD8-2 – Employer endorsed	Micro-credentials are officially recognised or co-developed by employers.
	SD8-3 – Labour market alignment	Micro-credentials directly address skill gaps identified in the labour market.
	SD8-4 – Job mobility support	Micro-credentials enable workers and students to transition between roles or geographies.
	SD8-5 – Digital workforce readiness	Micro-credentials equip learners with essential digital skills for evolving job markets.
Challenges & barriers	CB1 – Community resistance	Micro-credential adoption is hindered by concerns over academic integrity or workload.
	CB2 – Scalability concerns	Micro-credentials remain small-scale and lack strategies for institutional-wide expansion.
	CB3 – Regulatory barriers	National or alliance-level regulations complicate the recognition and implementation of micro-credentials.

Matrix dimensions	Codes	Indicators
Challenges & barriers	CB4 – Funding issues	Financial sustainability of micro-credential programmes is unclear or unstructured.
	CB5 – Employer scepticism	Employers remain uncertain about the value of micro-credentials in hiring and professional development.
	CB6 – Policy gaps	There are inconsistencies between institutional, national, and EU-level policies on micro-credentials.
Future directions	FD1 – Expansion to more disciplines	Plans are in place to scale micro-credentials to additional academic and professional fields.
	FD2 – Labour market partnerships	Collaborations with labour market stakeholders are being developed to enhance micro-credential credibility.
	FD3 – Exploring ECTS integration	Micro-credentials are being structured for recognition within the European Credit Transfer System (ECTS).
	FD4 – Developing new framework	Institutional or alliance-level frameworks for standardised micro-credential implementation are under development.
	FD5 – Launching a European-wide credential framework	Efforts are being made to create a harmonised recognition framework for micro-credentials across Europe.

Source: Authors' analysis

The application of this coding framework not only facilitates an empirical assessment of micro-credential adoption but also provides a foundation for policy recommendations. By systematically comparing alliances, the study contributes to a deeper understanding of how micro-credentials are shaping European higher education and the role they play in addressing skills gaps, workforce development, and educational inclusivity. Through this structured methodology, the study ensures that findings are grounded in institutional realities while contributing to broader discussions on modular learning, higher education sustainability, and policy standardisation.

The analysis matrix was applied systematically across all 65 alliances in order to capture the presence, scope, and characteristics of micro-credential initiatives. Each alliance was coded according to predefined categories, including references in strategic documents, curricular integration, alignment with SDG 4 and SDG 8, involvement of external stakeholders, and recognition mechanisms. This allowed us to identify both explicit and implicit references to micro-credentials and to compare alliances on a common set of indicators. The coding produced frequency counts (e.g., number of alliances explicitly linking micro-credentials to employability or sustainability) as well as qualitative profiles that highlight distinctive approaches. These outputs served

as the basis for synthesising patterns, commonalities, and divergences across alliances, which are presented next.

4. Findings

4.1. Engagement with micro-credentials in relation to SDG 4 and SDG 8

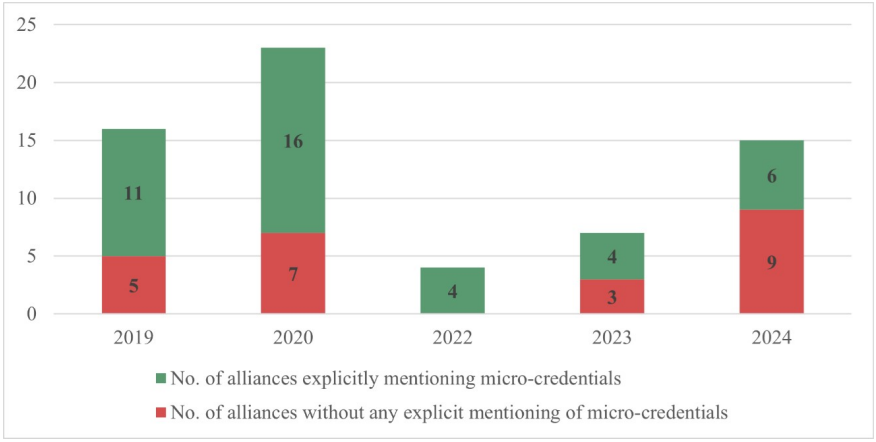
Micro-credentials have emerged as a key component in the evolving landscape of European higher education, with many universities exploring their potential to enhance curriculum flexibility, promote interdisciplinary learning, and address labour market needs. As part of the broader efforts of the EUI, micro-credentials are being positioned as means to facilitate mobility, upskilling, and lifelong learning while aligning with European policy priorities, particularly SDG 4 and SDG 8.

An analysis of the 65 European Universities Alliances reveals that 63% (N = 41) explicitly reference micro-credentials in their strategies, policy documents, or educational initiatives, signalling a growing institutional commitment to this emerging form of learning. However, their presence and depth of integration remain uneven. While some alliances have embedded micro-credentials as part of structured degree pathways, others engage with them as a secondary or exploratory initiative. A closer look at the distribution of alliances by year of establishment suggests that those starting more recently seem less present in micro-credential discussions, likely due to the short time available for structured engagement rather than a lack of interest (Figure no. 1). This observation highlights the dynamic nature of micro-credential adoption, where newer alliances are still in the process of defining their strategies and operational frameworks.

4.2. Strategic priorities shaping alliance approaches

While micro-credentials are becoming increasingly present in alliance strategies, the ways in which they are developed and promoted diverge significantly. A closer analysis reveals ***six distinct approaches***, reflecting different institutional priorities, governance structures, and operational focuses:

Figure no. 1. *Distribution of alliances by launching year and explicit mentioning of micro-credentials in publicly accessible information (N = 65)*



Source: Authors' analysis

- **Projects**, which focus on specific initiatives undertaken by alliances to develop micro-credentials, often as part of broader pilot programmes or experimental learning pathways.
- **Events**, including conferences, webinars, and workshops aimed at fostering discussion, knowledge exchange, and promotion of micro-credentials within the academic and policy communities.
- **Guidelines**, referring to structured documents, templates, trainings, and tools that provide direction for institutions and members of the academic community seeking to implement micro-credentials within their educational frameworks.
- **Micro-credentials**, representing specific educational offerings that are part of the alliance's educational framework.
- **Mission statements**, where alliances articulate their long-term vision and commitment to micro-credentials as part of their educational and strategic priorities.
- **Policy inputs**, involving contributions to the broader policy landscape through position papers, reports, advocacy, and engagement with policymakers on micro-credential development.

These six approaches illustrate the diverse ways in which alliances are engaging with micro-credentials, from direct educational provision to policy advocacy and capacity-building initiatives. As Table no. 2 shows, some

alliances focus on just one or two of these approaches, while others have taken a more comprehensive approach, integrating multiple dimensions into their micro-credential strategies.

Table no. 2. *Approaches on micro-credentials in each alliance (N = 41)*

Alliance *(acronym)*	**Approaches***						**Types per alliance****
	Projects	**Events**	**Guidelines**	**Micro-credentials**	**Mission statements**	**Policy inputs**	
4EU+	X		X			X	**3**
ACE2EU					X		**1**
ACROSS	X						**1**
ARQUS			X				**1**
AURORA				X			**1**
BAUHAUS4EU					X		**1**
CHARM-EU					X		**1**
CIVIS	X	X	X	X			**4**
COLOURS				X			**1**
E3UDRES2			X				**1**
ECIU		X	X	X	X	X	**5**
EDUC				X			**1**
EELISA			X				**1**
ENGAGE.EU				X			**1**
ENHANCE			X	X		X	**3**
ENLIGHT					X		**1**
EPICUR			X			X	**2**
EU4DUAL				X	X		**2**
EU-CONNEXUS			X	X			**2**
EUGREEN			X				**1**
EUNIWELL				X	X		**2**
EUPEACE					X		**1**
EURECA-PRO					X		**1**
EUROTEQ		X		X			**2**
EUTOPIA						X	**1**
FILMEU					X		**1**
HEROES					X		**1**
INGENIUM			X		X		**2**
INVEST				X	X		**2**
NEUROTECH-EU			X				**1**
OPENEU					X		**1**
SEA-EU				X			**1**
STARS EU					X		**1**
T4EU	X		X		X		**3**
U!REKA				X			**1**
ULYSSEUS	X						**1**
UNA EUROPA			X	X	X	X	**4**
UNIC					X	X	**2**
UNIGREEN			X		X		**2**
UNITA					X		**1**
YUFE				X			**1**
No. and % of alliances per type***	**5** (12.20%)	**3** (7.31%)	**15** (36.59%)	**16** (39.02%)	**20** (48.78%)	**7** (17.07%)	

Notes:

* An "X" is placed wherever any of the six types of approaches are identified in the respective alliance.

** The table counts how many of the six types of approaches are identified in the respective alliance, not the number of individual initiatives linked with each type.

*** Percentage (%) calculated based out of total number of alliances included in the analysis (N = 41).

Source: Authors' analysis

Among the 41 alliances included in the present study, the most common approaches involve ***mission statements*** (20 alliances, 48.78%) and ***guidelines*** (15 alliances, 36.59%), indicating a strong emphasis on *strategic vision and implementation frameworks*. Additionally, 16 alliances (39.02%) are *actively developing micro-credentials*, while *policy inputs* (7 alliances, 17.07%), *projects* (5 alliances, 12.20%), and *event-based activities* (3 alliances, 7.31%) remain more limited. Notably, 6 alliances (4EU+, CIVIS, ECIU, ENHANCE, T4EU, UNA EUROPA) demonstrate a multifaceted engagement with micro-credentials, covering at least three or more of these six approaches in their initiatives and institutional efforts. Their work reflects a more systematic and embedded approach, incorporating micro-credentials across policy, educational design, and implementation frameworks.

While the extent to which fully institutionalised micro-credentials varies across alliances, modular learning is expanding, supporting interdisciplinary education, mobility, and upskilling. There is also growing alignment between micro-credentials and broader European policy objectives, particularly in relation to lifelong learning, digital transformation, and workforce reskilling.

4.3. Implementation to support curriculum flexibility, mobility, and lifelong learning

Micro-credentials are increasingly used by European Universities Alliances to promote curriculum flexibility, interdisciplinarity, and customised learner pathways. Alliances showcase varied approaches, from standalone, non-credit-bearing certificates to fully integrated, stackable credentials within formal degree structures. This shift aligns with broader European trends towards modular, student-centred, and employment-responsive educational models.

A key attribute of micro-credentials is their *modularity*, enabling learners to build tailored educational pathways across disciplines and institutions. Alliances such as *CIVIS*, *CHARM-EU*, and *ECIU* leverage this modular approach to encourage stackable credentials, facilitating interdisciplinary engagement and allowing students to accumulate recognised qualifications

progressively. *CIVIS micro-programmes* (Figure no. 2) are a relevant example of such stackable learning experiences for undergraduate students.

Figure no. 2. *CIVIS Alliance online catalogue of modular micro-programmes*

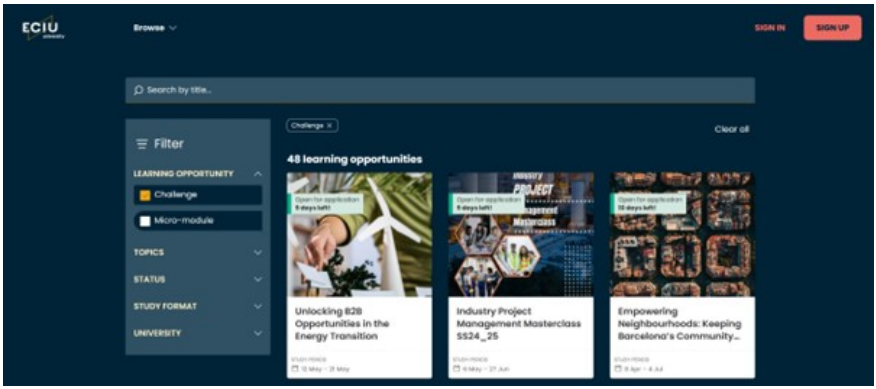
Source: https://civis.eu/en/learn/course-types/civis-micro-programmes (retrieved January 8, 2025)

Interdisciplinary education is significantly supported by micro-credentials, bridging traditional academic disciplines. For instance, *CHARM-EU* promotes transdisciplinary education in sustainability and climate action, integrating environmental sciences, economics, and policy. *ECIU* incorporates micro-credentials into challenge-based learning contexts, fostering problem-solving skills across multiple fields. Similarly, alliances focusing on *STEM (Science, Technology, Engineering, and Mathematics)* and applied sciences, including *EUROTEQ* and *EELISA*, integrate micro-credentials into engineering programmes, combining technical education with broader societal skills.

Micro-credentials also support lifelong learning and professional development by providing flexible, short-term educational opportunities aligned with evolving workforce demands. Alliances such as *AURORA*, *ENHANCE*, and *ENGAGE.EU* have structured pathways specifically catering to mid-career professionals, offering skill-upgrading opportunities responsive to technological and economic shifts. *ENGAGE.EU* and *EU4DUAL* exemplify models of integrating micro-credentials with work-based learning, fostering close collaboration between universities and industry partners, thus enhancing employability and labour market relevance.

As exemplified by Figure no. 3, *ECIU* emphasises a challenge-based approach, embedding micro-credentials within experiential learning environments, promoting innovation, adaptability, and critical thinking linked directly to real-world labour market needs.

Figure no. 3. *ECIU Alliance online catalogue of challenge-based micro-credentials*



Source: https://engage.eciu.eu/browse?learningOppTypes=623140000 (retrieved January 6, 2025)

Challenge-based learning represents another innovative application of micro-credentials. *ECIU* and *EUROTEQ* embed these credentials within practical, collaborative contexts that address real-world societal and technological issues, aligning with European policy emphasis on skills-oriented education. Furthermore, alliances such as *YUFE* and *UNIC* use micro-credentials to facilitate student mobility and cross-institutional recognition, demonstrating potential for enhanced transnational education. Nonetheless, scalability remains hindered by institutional fragmentation and varying policy frameworks.

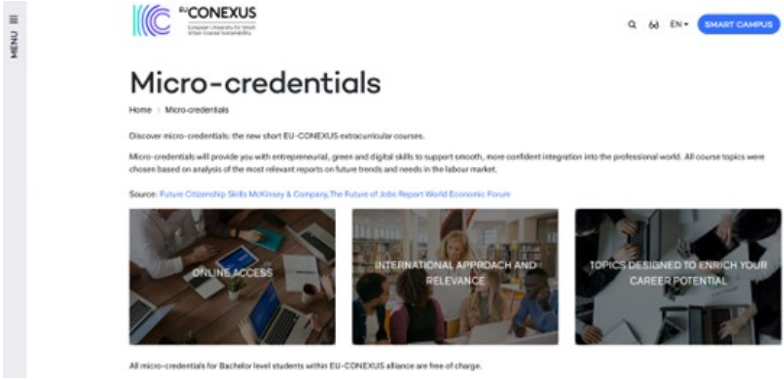
While alliances actively explore diverse strategies, maximising the potential of micro-credentials necessitates improved cross-institutional coordination, coherent governance models, and strengthened recognition frameworks to overcome existing barriers to widespread implementation and scalability.

Alliances increasingly leverage micro-credentials to align educational initiatives with sustainable development, specifically focusing on SDG 4 and SDG 8. Alliances apply these credentials to enhance educational accessibility, bridge skills gaps, and ensure adaptability to evolving labour market demands.

Micro-credentials significantly contribute to SDG 4 by broadening educational participation through flexible, modular, and digitally accessible learning pathways. Our analyses show that alliances such as *UNA EUROPA*, *EUTOPIA*, and *UNIC* specifically use micro-credentials to foster digital inclusion, enabling diverse learners, including working professionals and non-traditional students, to engage effectively with higher education. By offering blended and online micro-credential courses, these alliances provide accessible, targeted educational experiences responsive to individual and professional aspirations.

Further reinforcing SDG 4, *SEA-EU* and *EU-CONNEXUS* emphasise sustainability and environmental literacy within their micro-credential initiatives, aligning with European policies promoting climate action and sustainable workforce development (as Figure no. 4 exemplifies through the *EU-CONNEXUS* micro-credentials catalogue). Additionally, alliances such as *YUFE* and *UNIC* facilitate international education through mobility-focused recognition models, enabling learners to obtain and transfer micro-credentials across institutional and national borders.

Figure no. 4. *EU-CONNEXUS Alliance online micro-credentials catalogue linked with entrepreneurship, green and digital skills*



Source: https://www.eu-conexus.eu/en/micro-credentials/ (retrieved December 20, 2024)

In addressing SDG 8, alliances are explicitly aligning micro-credentials with workforce requirements, focusing on employability and adaptability. Initiatives by *EELISA*, *AURORA*, and *CIVIS* prioritise entrepreneurial, leadership, and digital competencies essential for labour market success. Alliances like *ECIU* and *EU-CONNEXUS* collaborate directly with industry partners to design credentials that respond to sector-specific needs in digitalisation, sustainability, and technological advancement.

Despite these developments, the findings indicate that the effectiveness of these initiatives depends significantly on enhanced employer engagement and clear, consistent policy frameworks at both alliance and national levels. Uneven employer involvement limits micro-credentials' labour market recognition, potentially restricting their influence on career advancement and workforce mobility.

The analysis further highlights *three systemic challenges* that must be addressed in order to maximise the contribution of micro-credentials to SDG 4 and SDG 8:

1. ***Standardised recognition***, ensuring micro-credentials are consistently recognised across institutions, employers, and NQFs remains essential.
2. ***Employer collaboration***, deepening engagement with industry stakeholders is necessary to secure employer recognition and ensure micro-credentials' labour market relevance.
3. ***Scalability and institutionalisation***, transitioning from experimental, project-based initiatives to sustainable educational offerings requires robust financial and institutional commitment.

Overall, the evidence suggests that while many alliances are exploring innovative ways of linking micro-credentials to sustainable development, these practices remain uneven and often limited in scope. Alliances that combine accessibility, mobility, and employer collaboration demonstrate the most advanced approaches, but broader policy coherence and systematic employer engagement are still needed to transform micro-credentials from experimental initiatives into core components of lifelong learning and workforce development.

4.4. Models, policy frameworks, and institutional factors influencing scalability and sustainability

Our results show that a primary obstacle to broader adoption is the lack of standardised recognition frameworks within the EHEA. Despite efforts by certain alliances, such as *EUTOPIA* and *UNA EUROPA*, to incorporate micro-credentials into defined educational pathways, disparities in national accreditation and policy frameworks create notable barriers. The inconsistent alignment of micro-credentials with the ECTS further complicates their transferability across institutions and national borders.

Although alliances like *CIVIS*, *CHARM-EU*, and *EU-CONNEXUS* have integrated micro-credentials within diploma supplements, such practices vary significantly across alliances, limiting student mobility and credential portability. Establishing uniform practices and coherent policies at institutional, national, and European levels remains essential for overcoming these structural barriers. Currently, micro-credentials are often perceived as supplementary rather than essential qualifications, limiting their impact on career advancement and employability. While *ECIU*, *EU-CONNEXUS*, and *AURORA* have made notable progress in establishing university-labour market collaborations, many micro-credential offerings remain academic-driven rather than employer-driven. To build greater trust between higher education institutions and employers, stronger efforts are needed to develop joint university - labour market certification models. Alliances such as *ENGAGE.EU* and *EUROTEQ* are exploring co-designed micro-credentials, integrating employer input into curriculum development to enhance their credibility in the job market. These initiatives serve as valuable models for bridging the gap between education and workforce needs.

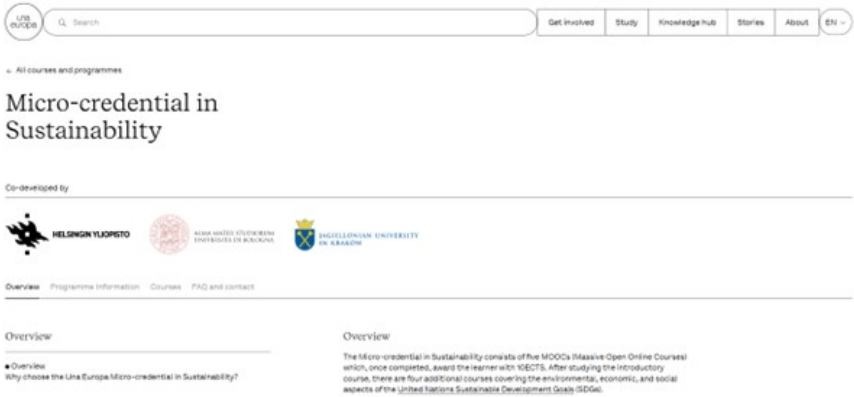
Despite these challenges and many others, there are clear pathways for strengthening micro-credential adoption across alliances. *A more coordinated European approach* (driven by policy coherence, labour market partnerships, and institutional capacity-building) is essential to overcoming these barriers and scaling micro-credentials as a core element of lifelong learning and workforce development. In this regard, some key actions could support the advance of micro-credential implementation:

1. EHEA-wide policy alignment: greater efforts are needed to harmonise micro-credential frameworks across national qualification systems. Aligning ECTS credit allocation, diploma supplement integration, and cross-institutional recognition mechanisms will be essential in ensuring seamless mobility and credential portability.
2. Stronger labour market ties: expanding university-labour market collaborations is crucial to enhancing micro-credential credibility and uptake. Employers should be actively engaged in co-designing curricula, assessing competencies, and endorsing micro-credential frameworks to improve workforce alignment.
3. Standardised credentialing frameworks: developing clear guidelines for micro-credential accreditation, quality assurance, and institutional governance will be vital in ensuring that micro-credentials become a stable and widely accepted component of higher education rather than remaining isolated experiments.

By addressing these systemic barriers, alliances can position micro-credentials as a transformative mechanism for lifelong learning, employability, and education accessibility. However, without sustained policy coordination, labour market engagement, and institutional commitment, micro-credentials risk remaining fragmented solutions rather than scalable, impactful credentials. Results show that several alliances have developed best practices that illustrate successful approaches to micro-credential implementation, showcasing how they can scale their micro-credential offerings, enhance policy alignment, and strengthen links with the labour market. By examining governance models, policy innovations, and emerging trends, example provide potential pathways for the broader adoption and institutionalisation of micro-credentials.

Strategy plays a critical role in determining the effectiveness and sustainability of micro-credential implementation. Some alliances have adopted structured strategic models, ensuring that micro-credentials are not just experimental initiatives but integrated components of institutional learning frameworks. For example, *UNA EUROPA* develops a joint micro-credential framework, integrating stackable, ECTS-aligned credentials across partner institutions, in a model that ensures learners can seamlessly combine micro-credentials into broader learning pathways, fostering both academic and professional mobility (see Figure no. 5).

Figure no. 5. *UNA EUROPA Alliance micro-credentials in sustainability, awarding 10 ECTS and is comprised of 5 MOOCs*



Source: https://www.una-europa.eu/study/microcredential-sustainability (retrieved January 10, 2025)

EUTOPIA embeds modular micro-credentials into degree programmes, ensuring portability and transferability across institutions, incorporating employer validation into select programmes, strengthening the link between higher education and workforce demands. *ECIU* establishes a challenge-based micro-learning model, in which micro-credentials are integrated into real-world, interdisciplinary problem-solving projects, enhancing active learning, innovation, and direct labour market engagement. *CIVIS* pilots transdisciplinary micro-programmes, showcasing how micro-credentials can address global challenges such as sustainability and digital transformation, reflecting the alliance's commitment to aligning education with pressing societal needs.

The expansion and sustainability of micro-credentials within alliances are closely tied to policy innovation and funding structures. As alliances navigate the complexities of implementation, EU-supported initiatives and policy frameworks play a crucial role in shaping best practices. Financial support from Erasmus+ and Horizon Europe, for example, has been instrumental in advancing micro-credential initiatives. Alliances such as *4EU+*, *ACROSS*, *T4EU*, and *ULYSSEUS* have leveraged funding to develop their approach on micro-credentials, ensuring financial sustainability and wider access to flexible learning pathways.

The *European Approach to Micro-Credentials* (European Commission et al., 2020) has influenced the alliances' approach on micro-credentials. *EUGREEN* and *CHARM-EU*, among others, seek to align their micro-credentials with EU qualification standards, contributing to the development of common accreditation pathways and cross-institutional governance models, enhancing learner mobility and credential recognition. On another note, other alliances, such as (but not only) *T4EU* and *SEA-EU*, explore blockchain-based credentialing solutions to improve transparency, streamline recognition, and prevent credential fraud, having the potential to create more secure and interoperable micro-credential ecosystems.

As micro-credential initiatives continue to evolve, several key trends are shaping their future trajectory across alliances. These trends reflect the increasing convergence between modular learning, workforce alignment, and digital transformation.

1. ***Stackable and hybrid learning models***: stackable micro-credentials that contribute to full degrees, reinforcing lifelong learning pathways, allowing learners to accumulate credentials over time, enhancing their educational and career progression.
2. ***Employer-embedded micro-credentials***: co-developed micro-credentials with employers, ensuring that learners acquire skills that align with evolving labour market needs, strengthening the credibility and employability potential of micro-credentials.
3. ***Cross-institutional and transnational standardisation***: multi-university recognition frameworks, paving the way for a European-wide credentialing ecosystem, contributing to greater micro-credential portability across higher education institutions.
4. ***Sector-specific and specialised credentials***: micro-credentials in emerging fields like green skills, AI, and digital transformation credentials, reflecting broader European policy priorities in sustainability and digital innovation.

The emergence of strong governance models, policy frameworks, and innovative funding mechanisms demonstrates the growing institutionalisation of micro-credentials within alliances. However, critical challenges remain, particularly in the areas of recognition, scalability, and labour market alignment.

Moving forward, we see that alliances should focus on:

- Strengthening policy coherence through EHEA-wide standardisation efforts that integrate micro-credentials into national and European qualification frameworks.
- Deepening labour market partnerships to ensure greater employer validation and uptake, making micro-credentials more than supplementary credentials but integral to workforce development.
- Enhancing financial sustainability by transitioning from project-based funding to long-term institutional integration of micro-credential frameworks.

By addressing these factors, alliances can solidify micro-credentials as a key instrument for flexible, high-quality, and future-proof education, reinforcing their role in shaping the next generation of higher education learning models.

5. Discussion

The general purpose of this study was to investigate how the 65 European Universities Alliances integrate micro-credentials into their educational strategies and practices, with particular attention to their contribution to SDG 4 (Quality Education) and SDG 8 (Decent Work and Economic Growth). Through document analysis and systematic mapping, the research sought to identify the ways in which alliances conceptualise and implement micro-credentials, the strategic priorities guiding their choices, and the institutional factors influencing scalability and sustainability.

5.1. Summary of main results

The findings highlight several important trends. First, *micro-credentials are increasingly recognised by alliances as instruments for curriculum flexibility, lifelong learning, and mobility*. While 41 alliances explicitly mention micro-credentials in their publicly available strategies, the depth of integration remains uneven, ranging from pilot initiatives to systematic inclusion in curricula. A second result is that *alliances associate micro-credentials with SDG 4 primarily through widening participation, digital inclusion,*

and international mobility (e.g., *UNA EUROPA*, *EUTOPIA*, *UNIC*, *YUFE*). For *SDG 8, they are linked to employability and adaptability*, with alliances such as *EELISA*, *CIVIS*, *AURORA*, and *ECIU* embedding labour market-oriented competencies. A third key result is the emergence of diverse strategic models, including mission statements, guidelines, and employer-driven frameworks, showing different levels of institutionalisation. Finally, the analysis reveals *persistent barriers related to recognition, standardisation, and employer engagement*, which constrain the broader scalability of micro-credentials across Europe.

5.2. Relation to previous studies

These results confirm previous literature emphasising the potential of micro-credentials to support lifelong learning, employability, and educational accessibility (Bozkurt & Brown, 2022; Brown et al., 2021; McGreal et al., 2022). They also echo findings that micro-credentials can enhance digital inclusion and sustainable skills development (Bideau & Kearns, 2022; Pirkkalainen et al., 2022). At the same time, the study provides evidence for ongoing concerns raised by Wheelahan & Moodie (2021) and Kušić et al. (2022) regarding fragmented recognition and scepticism from employers. Unlike Antonaci et al. (2021), who highlight increasing convergence towards standardisation, our results show that alliances still adopt heterogeneous approaches, often shaped by national regulations and institutional capacity. Thus, the present study adds nuance to the literature by demonstrating that while policy momentum is strong, practice within alliances remains uneven and experimental.

5.3. Theoretical and practical implications

From a theoretical perspective, the study underscores the relevance of networked governance models in higher education (Enders & De Boer, 2009), showing that *alliances function as laboratories where innovative forms of modular learning are tested and disseminated*. Micro-credentials within alliances can therefore be seen not only as pedagogical tools but as instruments of policy experimentation and institutional transformation in the EHEA.

From a practical standpoint, the study highlights the *need for policy coherence across institutional, national, and European levels*. Strengthening alignment with the ECTS and the EQF will improve portability and acceptance of micro-credentials. The findings also point to the *importance of labour market partnerships, as sustainable adoption requires stronger employer validation and joint design processes*. Furthermore, the *role of EU funding instruments* such as Erasmus+ and Horizon Europe emerges as critical for sustaining and scaling initiatives beyond pilot stages.

5.4. Limitations and future research directions

While the study provides a comprehensive examination of micro-credential implementation across European Universities Alliances, certain limitations must be acknowledged.

A first limitation concerns *data availability*, as some alliances provide more detailed and transparent information on their micro-credential strategies than others. This unevenness may generate data gaps, particularly in cases where alliances are in the early stages of development or where dissemination policies differ across alliances. Moreover, the analysis was restricted to a specific timeframe (October 2024 – January 2025), which may not fully capture subsequent institutional evolutions.

A second limitation relates to the *methodological approach*. The study relied primarily on document analysis and systematic mapping, without integrating direct stakeholder perspectives through interviews, focus groups, or surveys. While this strategy ensured comparability across all 65 alliances, it limited the exploration of individual decision-making processes, institutional rationales, and practitioner experiences. Furthermore, the analysis matrix used to structure the comparative assessment was developed specifically for this research. Although it offered a systematic framework, it requires further refinement, testing, and validation in different contexts to enhance its robustness.

Finally, the *diversity of alliances and models* means that findings may not always be directly comparable. Differences in governance structures, policy priorities, and national regulatory frameworks demand careful interpretation when generalising results.

These limitations open several avenues for future research. Empirical studies should integrate the *perspectives of institutional leaders, policymakers, and employers* to complement the document-based analysis and provide deeper insights into strategic choices and implementation barriers. Comparative case studies could explore in detail *how alliances operationalise micro-credentials in specific disciplinary, national, or regional contexts*. Further work is also needed to *refine and validate the analysis matrix*, adapting it into a replicable tool for *longitudinal monitoring of micro-credential adoption*. Expanding the temporal scope of analysis and incorporating longitudinal data would allow researchers to *track the evolution of alliances' engagement with micro-credentials over time*, thereby clarifying their long-term contribution to the objectives of SDG 4 and SDG 8. Finally, studies should also explore the *role of emerging technologies such as blockchain, digital badges, and AI-driven credentialing*, and assess the *long-term impact of micro-credentials on learners' employability, career adaptability, and contribution to the sustainability agenda*.

6. Conclusions

This study set out to examine how the 65 European Universities Alliances engage with micro-credentials as part of their educational strategies and practices, particularly in relation to SDG 4 (Quality Education) and SDG 8 (Decent Work and Economic Growth). By combining document analysis with systematic mapping, the research has shown that micro-credentials are no longer peripheral but increasingly embedded in alliance agendas, signalling a shift towards more flexible, modular, and labour market-responsive higher education.

The findings demonstrate that *alliances use micro-credentials to expand access to education, strengthen curriculum flexibility, and promote*

mobility and lifelong learning. Several alliances explicitly link these initiatives to digital inclusion and sustainability (SDG 4), while others emphasise employability, entrepreneurial skills, and industry collaboration (SDG 8). Strategic approaches vary, ranging from mission statements and guidelines to integrated curricula and employer-driven frameworks. However, challenges of recognition, scalability, and employer engagement remain persistent, limiting the transformative potential of micro-credentials across Europe.

From a broader perspective, *the study reinforces the role of alliances as laboratories of educational innovation and policy experimentation within the EHEA*. The results underline the importance of coherent policy frameworks, cross-institutional recognition mechanisms, and sustained financial and governance support to ensure that micro-credentials move beyond project-based pilots towards becoming stable and credible components of higher education provision.

Looking ahead, the institutionalisation of micro-credentials will require stronger partnerships with employers, alignment with European qualification frameworks, and integration into long-term educational strategies. If these conditions are met, micro-credentials can evolve from emerging initiatives into core building blocks of a more inclusive, adaptable, and sustainable higher education system, supporting not only the achievement of SDG 4 and SDG 8 but also the long-term resilience and competitiveness of European societies.

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