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The Concept of Micro-Credentials in the Context of Curriculum

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ABSTRACT

The aim of this study is to explain micro-credentials through the four components of a curriculum: objectives, content, teaching-learning processes, and assessment. This study was conducted using systematic review and the data were obtained through document analysis. Due to the lack of sources in Türkiye, the study sources consist of international articles, meeting minutes, booklets, books, brochures, and journals. Additionally, since online sources can also be used as data in document analysis, reliable official websites such as those of EHEA, OECD and YÖK were also used as study material, providing relevant information, definitions, statistics, and analyses. Content analysis was employed in the data analysis process. The data were categorized into four main themes: Objectives of Micro-Credentials, Content in Micro-Credentials, Teaching and Learning Processes in Micro-Credentials, and Assessment in Micro-Credentials. While some policymakers, educators, and trainers around the world have already recognized micro-credentials as useful practice and begun integrating them into policy frameworks, micro-credentials have become increasingly prominent in discussions of higher education in Türkiye in recent years. To understand the potential and limitations of micro-credentials, the issue should be made a state policy in Türkiye and a commission should be established to develop a framework. The practices of countries that have made progress in the field of micro-credentials should be studied, and interviews can be conducted with key stakeholders such as learners, employers, higher education institutions, and government officials, to examine micro-credentials from different perspectives.

Keywords: Micro-credentials, higher education, curriculum

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Introduction

In a world characterized by constant change, individuals' desires and needs have become increasingly diverse, which also impact educational systems that hold a significant place in people's lives. As Varış (1978) stated, education, which has a complex and multidimensional structure, is a product of interacting forces and possesses a multifaceted, comprehensive, continuous, and dynamic nature. The learning process, which begins at birth, continues within educational institutions as the individual reaches a certain age. Higher education institutions, where the individual actively and consciously carries out their education and learning process, are among the most crucial components of education.

Since their establishment, universities around the world have demonstrated continuous development and change on a national scale in order to provide more modern, academic, and high-quality higher education to the communities they serve. While countries work to advance their own higher education systems, they should also investigate different higher education systems worldwide and maintain communication with these institutions (Unvan, 2016).

To increase inter-university interaction and sharing, the Erasmus program was launched approximately 30 years ago, triggering structured collaboration among European higher education institutions. As demand for Erasmus student mobility rapidly increased, it became evident that the differing systems of universities led to incompatibilities. With the signing of the Sorbonne Declaration in 1998 by representatives from four countries, the aim was to create a common higher education area in Europe and facilitate student mobility and employability. Starting with these objectives, the Bologna Process continued in 1999 with the Bologna Declaration, signed by representatives from 29 European countries. The creation of the European Higher Education Area (EHEA) aimed to bring greater coherence to higher education systems across Europe (EHEA, 1999).

The realization of these goals, especially the implementation of an academic degree system that is easily applicable across countries, has necessitated that each country establish a National Qualifications Framework (NQF) within their higher education system. The concept of qualifications, which gives its name to the framework, can be described as the combination of what an individual knows, can do, and is competent in after successfully completing a short cycle, bachelor's, or doctoral degree in higher education (YÖK, 2024). While higher education institutions in countries are establishing their national qualifications frameworks, they must base their frameworks on two qualifications frameworks that are accepted at the European level. These frameworks, adopted by the European Union Council, are the Qualifications Framework for the European Higher Education Area and the European Qualifications Framework for Lifelong Learning. The most fundamental difference between these frameworks, which were adopted by the European Union Council three years apart, is the levels they encompass. The European Qualifications Framework for Lifelong Learning covers all levels of formal, non-formal, and informal education starting from primary education, making it more comprehensive than the Qualifications Framework for the European Higher Education Area, which only includes higher education levels such as short cycle, bachelor's, master's, and doctoral degrees.

Apart from the difference in levels, these two European Qualifications Frameworks (EQF) are similar in terms of their approaches and objectives. The EQF provides outcomes considering all stakeholders, including students, workers, and institutions. Since they follow a common understanding of qualifications, the mutual recognition of qualifications between institutions helps

higher education institutions to carry out their systemic processes more quickly and easily, while maintaining connections with other institutions. Students and workers with qualifications recognized by different institutions at the national and regional levels can use their qualifications in another country when needed, without the need to make additional efforts to prove their qualifications. The countries within the European Higher Education Area, including Turkey, which reached 49 members in 2022, base their national qualifications frameworks on the eight common European reference levels in the EQF, which contributed to the creation of a common language for qualifications. "These levels are ranked from one to eight, progressing from easy to difficult and from simple to complex. EQF levels are defined according to the minimum common learning outcomes that qualifications at these levels possess, regardless of any particular learning area" (TYÇ, 2024a). These learning outcomes are grouped into three categories: knowledge, skills, and competence, and are referred to as "level descriptors."

Since the publication of EQF in 2005, countries participating in the Bologna Process have entered into an intensive process to develop their own NQF. With the request for higher education institutions to get involved in the process from their respective countries, universities have been working to integrate new concepts such as competence, knowledge, skills, and qualifications into their systems. In recent years, however, they have also encountered another concept that has gained attention: micro-credentials.

The developing technology has also impacted higher education, leading to the increasing preference for Massive Open Online Courses (MOOCs) platforms. In 2008, at the University of Manitoba (Canada), a course on "Connectivism and Connection Knowledge" was offered, with 25 students attending face-to-face, while 2,300 students took the course online, thus introducing the world to the first MOOC experience. The emergence of MOOCs is attributed by Simon Nelson, a senior executive of a leading global company in the field of micro-credentials, to the digitalization of the industry and higher education sector, as well as the growing demand for quality university education in developing countries. Additionally, employers have supported these platforms due to the increasing technological demands and skill gaps in the workplace (Yilik, 2021). Before the pandemic, many governments across the OECD considered these short-term higher education programs as a tool for skill development and increased their value. These programs were seen as a means of expanding access to higher education, and governments invested in them. Most of these investments were publicly funded, aiming to scale up the education programs and expand their reach (OECD, 2021a).

With the onset of COVID-19, the global job market was disrupted, and the education sector experienced both positive and negative consequences. Millions of workers lost their jobs, struggled to find new employment, and were forced to stay at home. Students were unable to attend educational institutions and had to continue their education through digital platforms. Micro-credentials, which were already in demand before the pandemic through MOOCs, rapidly reached a much wider audience during the pandemic. Remote learning was introduced in higher education, hybrid classrooms were established, and partnerships were formed with major global online content providers such as Coursera and edX. Along with this intense digitalization, private firms have been expanding their micro-credential offerings (OECD, 2021a). Alongside universities and private enterprises, nonprofit organizations and large technology companies also provided micro-credential programs for individuals. Data from major education platforms, including Coursera, edX, FutureLearn, Kadenze, and Udacity, indicate that the number of micro-credentials offered increased from 600 in 2018 to 1,900 in 2022 (OECD, 2023).

The significant increase in the number of micro-credentials during the pandemic has drawn attention to the concept of "micro-credentials." Although various educational experiences have been offered under this term for years, it has gained prominence only in recent years (Oliver, 2019). As stated in the proposal presented by the European Commission, despite their increasing usage, there is no common definition or standard for micro-credentials in Europe. This lack of standardization limits the understanding of micro-credentials and, consequently, weakens their potential to facilitate flexible learning and career pathways (Iniesto, Ferguson, Weller, Farrow, & Pitt, 2022). To unlock the true potential of micro-credentials, it is essential to first establish a clear understanding of what the term entails. Institutions such as the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the European Commission have put forward draft definitions for this purpose. The European Commission defines micro-credentials as "proof of the learning outcomes acquired by an individual following a short learning experience" (UNESCO, 2022). In addition, Ankara University used its pioneering role to create a guideline on the subject in 2023 (AU, 2023), and the Council of Higher Education informed universities to accelerate this process in 2024.

Examining definitions of micro-credentials is essential for accurately understanding the concept and effectively implementing them; however, it is not sufficient on its own. To eliminate conceptual confusion among individuals and institutions, different dimensions of the micro-credential concept must also be clarified. As stated by UNESCO (2022), when properly implemented, micro-credentials can serve as part of formal education systems or as a complementary force. For this proper implementation in higher education institutions, it is considered beneficial to explain the concept of micro-credentials not only through its definition but also in relation to the four fundamental components of an educational program: objectives, content, learning-teaching processes, and assessment. Although major organizations such as the European Commission (EC), the OECD, and UNESCO, along with higher education institutions, have begun conducting extensive research on micro-credentials, uncertainties regarding the concept persist. The proliferation of micro-credentials along with uncertainties has led to a degree of chaos and confusion – for learners and for employers, but also for providers (Oliver, 2019). Although Türkiye has been a full member of the Bologna Process since 2001, MOOCs have only recently gained traction in Türkiye and it can be argued that the uncertainty surrounding micro-credentials applies to Türkiye as well (Yılık, 2021). This conceptual ambiguity regarding micro-credentials forms the basis of the research problem. In order to lessen this ambiguity and explain micro-credentials through the four components of a curriculum (objectives, content, teaching-learning processes, and assessment), the following questions will be addressed:

1. What are the objectives of micro-credentials?
2. What types of content is included in micro-credentials?
3. How are the teaching-learning processes of micro-credentials structured?
4. How is the assessment of micro-credentials conducted?

Method

Research Model

This study, which explains micro-credentials through the four components of an educational program-objectives, content, teaching-learning processes, and assessment-is an example of qualitative research. As Büyüköztürk, Çakmak, Akgün, Karadeniz, and Demirel (2017) state, the purpose of qualitative research is to achieve an in-depth understanding of a particular phenomenon. Similarly, Morgan (1996) emphasizes this characteristic of qualitative research, highlighting that it involves an effort to gain a deep perception of the phenomenon or event being studied. Unlike studies that present phenomena, individuals, or events through measurable characteristics such as quantity, average, or numerical values, qualitative research aims to explore the subject in detail by addressing questions such as "how" and "why" (Denzin & Lincoln, 1998).

In this study, document analysis as a qualitative research method document is employed. As Bowen (2009) defines “document analysis is a systematic procedure for reviewing both printed and electronic material”. Understood as a systematic review or evaluation of documents in various forms, document analysis “involves examining and interpreting documents to gain insights and understanding about a particular topic or research question”(ScienceDirect, 2025).

Since this study investigates a particular topic, namely micro-credentials, and provides a detailed description of the current situation using data collected through document analysis, it follows the systematic review. The fact that very few essays have been conducted on micro-credentials in Türkiye combined with the effort to gain an in-depth understanding of this topic through document analysis, makes this study well-aligned with this particular research design.

Data Source and Collection

The research data was obtained through document analysis, which involves identifying sources, reading, taking notes, and conducting evaluations (Karasar, 2005). Since micro-credentials are a relatively new topic in Türkiye, available sources on the subject are highly limited. Therefore, the primary sources for this study consist of international articles, meeting minutes, reports, booklets, books, brochures, and journals. In addition to printed materials, online sources have also been utilized, as researchers frequently use digitally acquired documents as primary resources (Bryman, 2012; Sakari. Şahin Sak, Şendil, & Nas, 2021). Specifically, reliable official websites such as those of EHEA, OECD, Eurydice, YÖK, MYK, and YÖKAK provided relevant information, definitions, statistics, and analyses on the subject.

Data Analyses

In this qualitative study, content analysis is employed. Document analysis refers to both a data collection method and a form of analysis, encompassing reviewing (superficial examination), reading (detailed examination), and interpretation. In this iterative process, elements of content analysis are integrated, necessitating thematic analysis (Corbin & Strauss, 2008). In thematic analysis, patterns within the data are identified, and emerging themes are categorized for further analysis. This process is carried out through content analysis, which involves transcribing and organizing the information related to the study’s main research questions into categories (Corbin & Strauss, 2008). In this study, the data extracted from documents were analyzed using descriptive analysis. This approach involves summarizing and interpreting the extracted data according to predefined themes (Mızıkacı et al., 2018). The selected themes in this study include objectives, content, teaching-learning processes, and assessment, through which the concept of micro-credentials is explained.

Ethics committee approval process

The ethics application for the study was made on 06/11/2023 and the research was carried out with the approval of Ankara University Ethics Commission dated 09/11/2023 and numbered 962.

Results

In the rapidly evolving process of change, the guiding and planning force of education and instruction is curriculum development. Tanner and Tanner (1980) defined curriculum as “the reconstruction of knowledge and experiences systematically developed under the responsibility of schools or universities.” The necessity for curriculum development arises from the dynamic nature of social life, culture, science, and technology, which increasingly demand a more highly qualified workforce (Duman et al., 2008). In this context, Varış (1978) emphasized that educational processes should be structured in accordance with social dynamism and contemporary conditions, while Ornstein and Hunkins (2016) highlighted that “curriculum is a continuously expanding phenomenon shaped by social and political dynamics.”

Higher education curricula cannot remain indifferent to these changes. In addition to the transformations and advancements observed in higher education systems, comprehensive changes in mindset, culture, and operational structures are also expected. As student demographics diversify and learning needs become more dynamic in higher education institutions, the demand for learning pathways that cater to a broader audience has increased. One such pathway is micro-credentials, which have emerged in recent years as a flexible and modular learning opportunity for individuals. While an increasing number of higher education institutions, including European universities, are currently focusing on the development of micro-credentials, there is no universally agreed-upon definition or approach regarding their validation and recognition (European Commission, 2020).

Examining definitions of micro-credentials is essential for accurately understanding the concept and effectively implementing micro-credentials; however, it is not sufficient on its own. To eliminate conceptual confusion among individuals and institutions regarding micro-credentials, various dimensions of the concept must also be clarified. As stated by UNESCO (2022), when implemented effectively, micro-credentials can serve as an integral or complementary component of formal education systems. In order to achieve this effective implementation in higher education institutions, it is considered beneficial to explain the concept of micro-credentials not only through its definition but also in relation to the four key elements of curriculum: objectives, content, learning-teaching processes, and assessment.

Objectives of Micro-Credentials

As defined by Demirel, an “objective” refers to the desirable characteristics that individuals are expected to acquire through education, encompassing knowledge, abilities, skills, attitudes, interests, and habits, among others (Demirel, 2015). Micro-credentials aim to enhance individuals' competencies in a specific area, thereby increasing their overall qualifications. An individual can pursue a micro-credential to “earn a degree, advance a non-career-related interest or skill for personal enrichment, or engage in professional development” (OECD, 2021b). With technological advancements and the evolving demands of the job market, individuals must continuously develop their skills throughout their adult lives to remain adaptable and “future-ready.” In this regard, micro-credentials serve as a means to promote lifelong learning (OECD, 2021b).

Moreover, micro-credentials aim to enhance social inclusion by facilitating access to higher education and vocational education and training for a diverse range of learners, including disadvantaged and vulnerable individuals. Through this approach, students can acquire labor market-relevant skills while also strengthening their well-being and their ability to fulfill their rights and responsibilities as citizens of democratic knowledge societies (OECD, 2023). Additionally, micro-credentials seek to support displaced workers and those whose skills have become obsolete or whose jobs are at risk due to automation. By helping these individuals acquire new, in-demand skills in the labor market, micro-credentials effectively contribute to reducing the mismatch between sought-after and existing skills (OECD,2023).

Micro-credentials also provide students with increased flexibility and accessibility while offering them the opportunity to showcase their skills to employers. For institutions, micro-credentials represent a potential solution to addressing rapidly changing skill demands and serve as a means to implement new pedagogies, increase enrollment, and reduce costs. For employers, micro-credentials facilitate a tangible way to assess the skills of potential employees and enable the rapid upskilling of their existing workforce (Carroll, Ginty, & Maguire, 2023).

Within the scope of quality assurance, micro-credentials aim to be accessible, stackable, and transferable, enabling individuals to leverage their prior learning when entering higher education institutions, progressing within these institutions, or transitioning between them at national and international levels. Additionally, they seek to facilitate the practical and universal implementation of this system by institutions through a common policy framework

In summary, the primary objectives of micro-credentials include enabling individuals to achieve higher levels of personal development, enhancing employability, labor market participation, and overall gains among stakeholders, expanding pathways to higher education, and facilitating access to higher education through digitalization. Additionally, they aim to promote the social inclusion of disadvantaged individuals and, most importantly, to ensure that prior learning acquired through non-formal and informal education can be accumulated, utilized, and recognized within the formal education system (OECD, 2021b).

Content in Micro-Credentials

Content refers to the selection of topics aligned with program objectives (Duman et al., 2008). In today's world, two dominant factors influence content selection in education: the rapid advancements in science and technology and the emergence of new knowledge (Demirel, 2015). This is also true for micro-credentials, which are relatively new in education. In addressing the question, "What should we teach?" a wide range of topics is incorporated into micro-credential programs to ensure the achievement of desired learning outcomes.

Micro-credentials must be content-rich to contribute to individuals' personal, social, cultural, and professional development and to help them secure a strong position in the labor market. As humans are inherently learning beings with no limits to learning, the content of micro-credentials should be determined by considering the needs of target student groups and employers identified through analysis. In other words, once the objectives are clearly and explicitly defined, the content should specify and structure what will be implemented to achieve these objectives (Ünsal, 2021). Additionally, micro-credentials should be developed in alignment with the needs of both current students and new potential learners who may engage with them as part of ongoing professional education (Camilleri and Hudak, 2018).

In recent years, micro-credentials have enabled individuals to acquire knowledge, skills, and competencies in popular fields such as artificial intelligence, digitalization, sustainable living and environmental awareness, e-sports, creative content production, and computer programming. Additionally, the OECD Learning Compass 2030 outlines future-proof competencies, including transformative skills such as creating new value, reconciling tensions and dilemmas, taking responsibility, and autonomous learning (OECD, 2019).

Millions of people worldwide use MOOC (Massive Open Online Courses) platforms such as Udemy, edX, Coursera, FutureLearn, Udacity, Swayam, Kadenze, Fun, and OpenLearning for various purposes, including career development, career transitions, university preparation, employment, supplementary learning, lifelong learning, corporate remote education, and more. According to its official website, MOOC offers over 3,000 courses. These courses cover a wide range of subjects, including information technology, languages, finance, chemistry, physics, health, mathematics, marketing, social sciences, personal development, media studies, humanities, investment, entrepreneurship, current affairs, business management, computer programming, creative arts, data science, and software development. Additionally, users searching for micro-credentials in other fields can utilize the search function, further demonstrating the richness of the platform's content. When examining the implementation of micro-credentials in universities, variations in scope can be observed. For instance, Harvard University currently offers a variety of programs under seven main subject categories (online.hbs.edu). In contrast, the "European University for Well-Being" (EUniWell), a consortium of 11 universities from different European countries, developed micro-credential programs exclusively on the topic of "well-being" as part of a pilot initiative during the 2021/22 academic year (OECD, 2021a).

Learning-Teaching Processes in Micro-Credentials

Learning-teaching processes ensure that educational objectives are effectively achieved through well-planned courses, topics, and activities (Varış, 1978). These processes encompass several key elements, including materials, feedback, strategies, methods, techniques, physical arrangements, time, cues, reinforcements, and teacher behaviors. In learning-teaching processes, emphasis is placed on when, where, and how the objectives will be taught to the learner (AU, 2024).

When examining these questions within the context of micro-credential implementation, the most prominent shared characteristic appears to be "flexibility." There is no single standardized learning environment. Instead, "learning environments" refer to all settings where formal, non-formal, and informal learning occurs. These environments include diverse physical, online, blended, virtual, and digital spaces, as well as various contexts and cultures where people engage in learning (UNESCO, 2022).

Just as learning environments are not uniform, the time for learning is not fixed either. By having access to flexible and easily accessible opportunities in online learning environments, learners can progress at their own pace, at a level and intensity that suits them (Kır & Bozkurt, 2022). In other words, the flexibility offered by modular education provides potential students with more options for organizing their studies, giving them control over the content of their work, as well as the option to participate in online or campus-based activities, along with flexible entry and exit times (Nuffic, 2022). In short, with blended-format courses (in-person and online), students have the opportunity to plan their micro-credential hours, taking into account work or caregiving responsibilities (Hendrikx & Ubachs, 2019).

Flexibility is also evident in teaching strategies. The introduction of courses by higher education institutions on MOOC platforms has led university faculty members to reflect on their teaching strategies and adopt innovative perspectives (Hollands & Kazi, 2019). The general flexibility in educational situations should not be associated with disorder or lack of rules. On the contrary, micro-credentials are supported by quality assurance and are aligned with agreed-upon standards in the relevant sector or field of activity.

As explained by Camilleri and Hudak (2018), when examining the courses offered by major platforms such as LinkedIn Learning, Coursera, Atingi, Alison.com, and edX, three main types of training can be identified that ultimately lead to the acquisition of micro-credentials. These courses, referred to as skill-focused micro-credentials, micro-credential modules, and short learning programs, tend to vary in terms of size, complexity, and degree of recognition.

Skill-focused micro-credentials are a tool for recognizing and certifying individuals' skills, knowledge, abilities, and achievements. They allow students to connect with recruiters and new contacts. Skill-focused micro-credentials typically involve 4-12 hours of learning, they are provided within informal education, they do not include external quality assurance, and they are linked to the acquisition of a specific competency.

Micro-credential modules typically range from 1 to 5 ECTS credits and focus on academic skills. They are often separate from undergraduate programs but can be reassembled later to count toward other programs. Micro-credentials are typically structured as MOOC offerings. They usually represent 25-150 hours of learning, are delivered within formal education, include assessment options, and are explicitly supported by external quality assurance. These micro-credentials are linked to the acquisition of a set of academic competencies.

Short Learning Programs are the most recent addition to the micro-credential field. They represent the acquisition of academic skills through a series of courses. These course packages can be offered in two ways: a series of 'module-based' micro-credentials that can be taken independently and later combined into a larger micro-credential, or a series of courses that are only available as part of the short learning program. These short-term learning programs are often related to professional stages and can be used to access certain job opportunities. Thus, a typical short learning program represents 150-1500 hours of learning, is delivered within formal education, includes assessment options, always has explicit external quality assurance, is placed within a qualification framework, and is linked to specific career advancement goals (Camilleri and Hudak, 2018).

As seen in the examples, within the context of learning-teaching processes, micro-credential providers should make every effort to offer students the opportunity to pursue micro-credentials in different ways, at different times, and in different locations (European MOOC Consortium, 2018).

Assessment in Micro-Credentials

Another element that helps make the micro-credential implementation more understandable is assessment. The purpose of assessment is to determine the extent to which learning outcomes have been achieved through learning-teaching experiences, to clarify whether sufficient practice has been conducted, and to explain the level of success impartially (Ünsal, 2021). Ertürk defines assessment as "the process of determining the degree to which educational objectives have been achieved" (1993). The Council of the EU defines the concept of assessment in micro-credential implementation as the process or method used to evaluate, measure, and ultimately define the

learning outcomes achieved by individuals in formal or non-formal environments (2022). Assessment is carried out by micro-credential providers. It should always be aligned with the learning objectives specified within the micro-credential and should be consciously chosen to measure whether the student has mastered a particular knowledge, skill, and competence.

The purpose of assessment is to determine the extent to which learning outcomes have been achieved through learning-teaching experiences, to clarify whether sufficient practice has been conducted, and to reveal the level of success impartially.

A critical differentiator in the definition of micro-credentials used by the Council of the EU is the sentence: "Micro-credentials' learning outcomes should be assessed according to transparent and clearly defined criteria" (Council of the EU, 2022). Brown et al. also emphasize this critical point, stating that assessing learning according to the specified learning outcomes and having transparent standards is important for building trust, recognition, and quality assurance (2021). In cases where short-term learning, such as participation certificates in MOOCs, offers only unassessed learning opportunities, micro-credentials are not considered as micro-credentials according to the EU definition.

As stated by ETF, the European Education Foundation (2022a), in order to increase the recognition of micro-credentials and trust in them, micro-credential providers must implement assessment criteria and methods and certify them under quality assurance. The alignment of the assessment processes of the learning outcomes defined in the micro-credential should be evaluated by consulting stakeholders, trainers, or assessors, and should be tested to assess their effectiveness and practicality. The quality of the assessment and how the assessment methods and criteria are determined are critical for ensuring the reliability, objectivity, and validity of the assessment and the trustworthiness of the results.

Based on the Standards and Guidelines for Quality Assurance in the European Higher Education Area (2015), a quality assessment should ensure the following:

- Assessment criteria and methods, as well as grading criteria, are published in advance.
- The assessment allows students to demonstrate the extent to which the intended learning outcomes have been achieved.
- Feedback is provided to students, including, where necessary, advice related to the learning process.
- Assessors or assessment designers are familiar with the current testing and evaluation methods and are trained to develop their skills in this area.
- The assessment is consistent, applied fairly to all students, and carried out in accordance with the established rules.

To determine whether students have achieved the learning outcomes, micro-credential designers and providers should formulate the criteria, forms, and procedures. While multiple-choice tests and other assessment techniques that can be easily automated may offer low-cost scalability, they are not always the best choice for demonstrating the value of learning outcomes. Project-based or problem-based learning assessment methods are commonly used in micro-credentials such as "Engaged Citizens" and "Micro-Modules" provided by the European Universities Association. Written exams or project presentations combined with practical applications and followed by a question-and-answer method tend to provide a more valid representation of student performance. Other assessment tools include test-based exams, numerical exercises that measure analytical skills, journals or portfolios, written or oral exams, and peer

evaluations. The evaluation of these assessments is typically conducted through self-grading, peer grading, or external evaluation (either automatically or manually by an instructor).

If a micro-credential is skill-based and requires students to demonstrate a specific skill, the assessment must be able to measure and evaluate whether the student has mastered that particular skill. How this is done largely depends on how the micro-credential is delivered. For example, if the objective is to weld a copper piece and the micro-credential knowledge is provided online, a suitable authentic assessment might be a video recording of the student welding a copper piece and explaining each step of the process. In addition to video demonstration presentations, project-based assessments, problem-based assessments, scenario-based assessments, video demonstrations, written assessments, portfolios, workplace observations, dialogues, or discussions (presentations, interviews, debates) are also used as assessment tools in micro-credential applications (e-Campus, 2024).

After the assessment process, which is carried out according to specific criteria, the learner becomes eligible to receive the micro-credential certificate upon payment of the determined fee. In fact, some courses assess individuals to determine whether they possess the required skills and knowledge without requiring them to participate in the course. For example, in New Zealand, the cost of receiving a certificate by only participating in the assessment without attending the course ranges from 80 to 199 New Zealand Dollars (OECD, 2021a). In short, whether the individual attends the course or not, there can be no assurance that the micro-credential has fulfilled its purpose without an assessment.

Micro-credential providers should consider on-site assessment with identity verification as the most effective method. For micro-credential providers who can only organize assessments online, “An Adaptive Trust-based e-assessment System for Learning” (TeSLA) recommends the use of biometric tools such as facial recognition, voice recognition, and keystroke dynamics to verify the student's identity (TeSLA, 2018).

Another important point to consider when thinking about micro-credential assessment is the evaluation of non-formal and informal learning. For micro-credentials that provide such learning, organizing the assessment in a way that is purpose-driven and quality-assured is crucial for recognizing future educational and instructional objectives (ETF, 2022b).

Discussion and Conclusion

The globalized knowledge economy requires all individuals to engage in continuous and lifelong learning to remain productive. Since 2008, the demand from students for short and flexible learning formats, along with the need for verified skills-based education to meet the evolving demands of the workforce and employers in the new era, has challenged higher education programs. Industry-driven, demand-based, small-scale, and personalized massive open online courses (MOOCs) and certifications are transforming the educational landscape and learning methodologies.

One of the key factors driving this transformation is micro-credentials. A micro-credential is a certification that verifies the acquisition of knowledge, skills, competencies, and values in a specific field of study and/or practice through a smaller sequence of courses, modules, or units (Camilleri and Hudak, 2018). However, the definition and implementation of micro-credentials vary and remain a topic of ongoing discussion. This conceptual ambiguity surrounding micro-credentials may hinder the understanding of the concept. Therefore, it has been suggested that

describing micro-credentials in the context of curriculum components would be beneficial for a clearer understanding.

In the context of objectives, it has been observed that micro-credentials are explained through different stakeholders. The findings indicate that individuals pursue various goals through micro-credentials. These include acquiring knowledge, skills, and competencies, gaining labor market-related skills, recognizing prior learning officially and enhancing social inclusion by improving access to education and training for disadvantaged and vulnerable individuals. In addition, employers aim to use micro-credentials to rapidly upskill their existing workforce, verify individuals' claimed competencies through digitally reliable credentials, and select the right employees for their companies. Higher education institutions, on the other hand, aim to facilitate the recognition of prior learning, expand pathways to higher education, and improve access to higher education through digitalization.

In the context of content, micro-credentials are described as rich and diverse. This richness highlights the importance of conducting needs analyses for the target learner group and employers to select content aligned with the intended competencies. Additionally, the planning of content is discussed with consideration of potential target audiences.

In the context of teaching-learning processes, "flexibility" is emphasized in micro-credentials. It has been concluded that learners can acquire micro-credentials in different places, at different times, and in various formats. Learning environments include physical, online, blended, virtual, and digital spaces, as well as diverse contexts and cultures. Regarding time, learners have the opportunity to adjust the timing of their micro-credentials while considering their work and other responsibilities, allowing them to progress at their own pace. Analyzing the training provided by MOOC platforms, micro-credentials are categorized into three types based on their size, complexity, and level of recognition: skill-based micro-credentials, micro-credential modules, and short learning programs.

In the assessment processes of micro-credentials, establishing trust, recognition, and quality assurance is essential. To enhance the recognition and credibility of micro-credentials, it is necessary for micro-credential providers to implement transparent assessment criteria and methods and ensure certification under quality assurance mechanisms. The quality assessment components outlined by ESG (2015) have been shared, along with the tools used for evaluating micro-credentials. For providers that conduct assessments exclusively online, the use of the TeSLA system has been recommended. Additionally, the importance of organizing assessments with quality assurance for non-formal and informal learning has been highlighted to ensure alignment with intended objectives.

Suggestions

- As a member of the European Higher Education Area (EHEA) since 2001 within the Bologna Process, Türkiye needs to focus on the concept of micro-credentials, just as other EHEA countries have emphasized.
- Given the significant increase in the number and diversity of micro-credentials in higher education systems worldwide in recent years, micro-credentials should be established as a state policy in our country.
- Micro-credentials should be integrated into employment policies and active labor market policies.

- The role of stakeholders is crucial in the process of developing a micro-credential policy. Stakeholders may include higher education institutions, other alternative educational institutions, official and private organizations such as YÖK, YÖKAK, MYK, MEB, academic staff, students and learners, employers, company representatives, and quality agencies.
- The commission established could conduct promotional and dissemination activities to ensure that micro-credentials are understood more quickly and accurately by stakeholders.
- The commission should examine the national micro-credential frameworks of countries that have made progress in the field, such as Ireland and Australia.
- After conducting research, the commission should develop a Turkish framework for micro-credentials.
- Awareness could be raised regarding the use of massive open online course platforms that offer micro-credentials, such as Coursera, Udemy, edX, FutureLearn, Swayam, and Teacher Academy.
- Procedures should be developed to fully or partially validate and recognize previous learning acquired in formal, non-formal, and informal learning environments in order to facilitate the earning of micro-credentials.
- A culture of effective lifelong learning should be established with micro-credentials, ensuring that individuals possess the knowledge, skills, and competencies necessary to succeed in society, the labor market, and personal life.
- Other micro-credential providers, including higher education institutions, vocational education and training institutions, adult education organizations, and employers, should develop lifelong learning opportunities for individuals.
- An effective quality management system should be established, covering all aspects of the design, development, implementation, evaluation, monitoring, review, improvement, and certification of micro-credentials for quality assurance.
- Interviews can be conducted with key stakeholders such as learners, employers, higher education institutions, and government officials to examine micro-credentials from different perspectives.

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Conflicts of Interest

There is no conflict between the authors.

Ethics

Since this study was conducted through document analysis, it does not require ethical committee approval. It does not include any research requiring ethical approval, such as: any qualitative or quantitative research involving data collection from participants through techniques such as surveys, interviews, focus group studies, observations, experiments, or other similar methods. the use of humans or animals (including materials/data) for experimental or other scientific purposes, clinical research conducted on humans, studies conducted on animals, retrospective studies requiring compliance with personal data protection laws.

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