Micro-Credentials and Green Standards – An International Approach of Sustainability Learning

Javier Rodrigo Ilarri[1], Camelia Tulcan[2], Luis Manuel Sánchez-Ruiz[1], Nuria Llobregat-Gómez[1], María Elena Rodrigo Clavero[1] Dorin Camen[2], Sorina Popescu[2], Maria Roberta Tripon[2], Florin Huiban[2],Yanislav Zhelev[3], Mariya Zheleva[3] , Iuliana Chilea[4,6], Speranta Stomff [4], Mihaela Stancu[4], Rositza Georgieva[5]

1. University of Life Sciences "King Mihai I" from Timisoara (USVT)
2. Universitat Politècnica de València (UPV)
3. Burgas Free University (BFU)
4. Romanian Standards Association (ASRO)
5. Bulgarian Institute for Standardization (BDS)
6. Bucharest University of Economic Studies

DOI: 10.63467/alls14.art8

Abstract

This paper presents the experience gained through the successful implementation of international project B-Green-ED Project (Project No 2022-1-BG01-KA220-HED-000085821) which main objective is to stimulate the European green economy and climate neutrality by developing innovative higher education practices related to the implementation of micro-credential (MC)

courses developed in cooperation with European standardization bodies. The developed innovative micro-credential courses have been in line with labor market needs and facilitate the provision of flexible, accessible, and inclusive learning focused on the industry/sector-related environmental, management, and green standards that support the transition to a green and digital economy. The information structure in the micro-credentials template inside the B-GREEN-ED project follows the EU standard for constitutive elements of micro-credentials proposed by the European Commission Consultation Group. During the B-GREEN-ED project, a set of micro-credentials courses have been developed and piloted. Inside the B-GREEN-ED project, micro-credentials have been conceived as stand-alone activities, though the university partners may consider recognizing univocally a specific set of online courses, depending on their own internal education strategy.

Different surveys have been done to test and check the student's opinion about the micro-credential development and organization. Overall, students believed that micro-credentials provided a competitive advantage in the labor market. Job prospects and career opportunities can be improved using these credentials by demonstrating continuous learning and practical skill application. According to the students, micro-credentials were crucial for fostering a more knowledgeable and skilled workforce, leading to societal advancement.

Keywords: micro-credentials, green economy, standardization, quality assurance.

1. Introduction

The European Commission has recognized the key role standards play on the internal market and internationally, for boosting the competitiveness of the economy and applying innovations, however, the impact of standards is highly dependent on the level of knowledge among the workforce.

The B-Green-ED project (Boosting The Green Future Via University Micro-Credentials) has been funded as an ERASMUS+ KA2 activity (agreement number 2022-1-BG01-KA220-HED-000085821). The project has been developed in 2023-2024 by four High Education Institution (HEI) partners from Bulgaria (Burgaski Svoboden Universitet -

BFU), Romania (Universitatea de Științele Vieții „Regele Mihai I" din Timisoara - USVT), Spain (Universitat Politècnica de València - UPV), Lithuania (Mykolo Romerio Universitetas - MRU) and two Standardization Institutions from Romania (Asociația De Standardizare Din Romania - ASRO) and Bulgaria (Bulgarski Institut za Standartizacia - BDS).

The main objective of the project is to boost the European green economy and climate neutrality through the development of innovative HE practices related to the implementation of micro-credentials designed in cooperation with European standards bodies that meet the market needs and facilitate the provision of flexible, accessible, and inclusive education in relevant industry/sector standards that support the transition to a green and digital economy.

In the framework of this aim the achievement of the following objectives has been foreseen:

- encouragement of innovation in the provision of flexible training opportunities that enhance the existing HE degree programs via the design and development of curricula for micro-credential courses aiming to overcome skills mismatches related to management, environmental and green standards, and standardization;
- supporting the inclusive and resilient remote high-quality learning and teaching through the establishment of a digital learning plaoorm that provides a tailored virtual learning environment that facilitates access to HE, including for those from disadvantaged backgrounds;
- fostering the usage of digital technologies and e-learning standards for the development of high-quality interoperable and re-usable learning content and educational tools;
- strengthening the relation academia-industry to provide more inclusive curricula and more flexible learning pathways that meet market needs with responsiveness and agility.

During the B-Green-ED project, 12 micro-credentials have been implemented, as shown in **Table 1**.

Country	Partner	MC Course Name
Bulgaria	BFU	1st Course (BFU) - Circular Economy, Business Models and Green Standards
		2nd Course (BFU) - Electronics and Communication of Renewable Energy Sources

		3rd Course (BFU) - Engineering and Exploitation of Energy Systems
Lithuania	MRU	1st Course (MRU) -Andragogical technologies and safe environment
		2nd Course (MRU) - Social responsibility and career management
		3rd Course (MRU) - Social responsibility in family work
Romania	USVT	1st Course (USVT) - Risk Management in Bioeconomy course
		2nd Course (USVT) - Carbon footprint assessment
		3rd Course (USVT)- Biomass and Good Practices in the Management of Degraded Lands and Desertification
Spain	UPV	1st Course (UPV) - Quality Management Systems standards
		2nd Course (UPV) - Environmental Management Systems standards
		3rd Course (UPV) - Waste Management and Industrial Pollution Control Standards

Table 1. List of micro-credentials implemented in the B-GREEN-ED project

2. The B-Green-ED Micro-Credential Strategy

In recent years, a trend towards diversification of education provision by higher education institutions can be observed. In addition to traditional bachelor, master or doctoral degree programmes, various new short, more flexible, learner-centered forms of education and training that fit the needs of a wider range of learners have been offered. Also, other public and private providers offer different forms of short-term education and training targeting various groups of learners. This is the response to the changes on the labor market, where a growing number of adults, with a higher education degree or lower, will have to reskill and upskill to fill the gap between the competencies acquired through initial formal learning and emerging knowledge and skills needed. In particular, the COVID-19 crisis has resulted in a substantial increase in demand for various forms of flexible on line continuing education and training offered by higher education institutions and other providers (D.Orr et al, 2020).

These alternative forms of learning are offered under different names (MICROBOL, 2021),

leading to confusion and problems with their understanding, recognition and appreciation by prospective learners and employers. This has resulted in an effort, in Europe, to address this issue and develop measures that would allow interested stakeholders to better understand and recognize the value of various forms of short education and training programmes and the resulting credentials, for which the term "micro-credentials" is currently increasingly commonly used. Although the development of various forms of micro-credentials is primarily market-driven, they are beneficial not only for professionals who would like to update their competences or acquire new competences that would give them a better position on the labor market. Micro-credentials, especially those offered by higher education institutions, bring benefits to students enrolled in traditional degree programmes, complementing or supplementing these programmes, through enhancing students' opportunities to develop transferable skills useful for their future careers.

Micro-credentials also create new opportunities for various groups of non-traditional students – life-long learners. They address the needs of those who would like to enhance their personal competencies and also create pathways into tertiary education for various groups of learners from disadvantaged backgrounds. With the demographic changes observed in Europe, it is of a key importance to create the education offer for elderly people that would allow for active ageing in the digital age. Therefore, offering various short-term forms of learning certified by micro-credentials can be seen as the essential part of the "third mission" of universities and their social responsibility (Carțiș A. et al, 2022).

Micro-credentials have the high potential of social impact. They allow people to maintain and acquire various competences that enable them to participate fully in society, ensure their personal, social and professional empowerment, and thereby create better lives and better opportunities for all. Therefore, micro-credentials are high on the agenda of various political initiatives taking place at the European level. This is reflected in several documents of the European Commission, including:

- the communication on achieving the European Education Area by 2025 (European Commission, 2020);
- the updated Digital Education Action plan (European Commission, 2020);

- New Skills Agenda for Europe (European Commission, 2020).

In this context, it is expected that the significant progress will be made because of the European Universities Initiative with European Universities developing and testing micro-credentials, thereby paving the way for other higher education institutions to follow. In fact, several European Universities alliances, including European Consortium of Innovative Universities (ECIU) and Young Universities for the Future of Europe (YUFE), have already reported some achievements in this area. High expectations regarding the contribution of the European Universities to the development of micro-credentials have been emphasized in a recent European Commission document for the meeting with rectors of European Universities (European Commission, 2021), where one of its six sections is devoted to the European approach to micro-credentials. In the report of the European Commission Consultation Group (2020), a micro-credential is defined in the following way:

> *"A micro-credential is a proof of the learning outcomes that a learner has acquired following a short learning experience. These learning outcomes have been assessed against transparent standards. The proof is contained in a certified document that lists the name of the holder, the achieved learning outcomes, the assessment method, the awarding body and, where applicable, the qualifications framework level and the credits gained. Micro-credentials are owned by the learner, can be shared, are portable and may be combined into larger credentials or qualifica-ons. They are underpinned by quality assurance following agreed standards".*

An essential part of the micro-credential's framework is the micro-credential template. In this sense, the proposed EU standard for constitutive elements of micro-credentials, introduced by the European Commission Consultation Group, essentially defines elements of a micro-credential template. The information structure in the micro-credentials template inside the B-GREEN-ED project follows the EU standard for constitutive elements of micro-credentials proposed by European Commission Consultation Group (2020). For each one of the micro-credentials, the information shown in **Table 2** has been recorded.

1. Identification of the learner
2. Title of the micro-credential
3. Country of the issuer
4. Awarding body
5. Date of issuing
6. Workload needed to achieve the learning outcomes
7. Level of the learning experience leading to the micro-credential (EQF and/or national qualifications framework)
8. Learning outcomes
9. Form of participation in the learning activity
10. Prerequisites needed to enroll in the learning activity
11. Type of assessment
12. Supervision and identity verification during assessment
13. Quality assurance of the learning content
14. Integration/stackability options

Table 2. Recorded information from each MC course

The European Qualifications Framework (EQF) acts as a translation device to make national qualifications more readable across Europe, promoting workers' and learners' mobility between countries and facilitating their lifelong learning. The EQF system attempts to relate national qualification systems of different countries to a common European reference framework. Individuals as well as employers will be able to use the EQF to better understand and compare the qualification levels of different countries and different education and training systems.

Formally adopted by the European institutions in 2008, the EQF is being put in practice across Europe. It encourages countries to relate their national qualification systems to the EQF so that all new qualifications issued from 2012 carry a reference to an appropriate EQF level. The EQF system has eight reference levels describing what a learner must know, understand and be able to do – "learning outcomes". In EU language, learning outcomes are specified in three categories: knowledge, skills and competences. Levels of national qualifications will be placed at one of the central reference levels, ranging from basic (Level 1) to advanced (Level 8). As each B-GREEN-ED micro-credential has learning outcomes defined potentially we can assign an EQF level to it by mapping those learning outcomes onto the European Qualifications Framework (EQF). B-GREEN-ED micro-credentials are included inside EQF 7 and 8.

Inside the B-GREEN-ED project, it has been decided that micro-credentials are awarded by individual universities. Therefore, the principles and procedures for quality assurance used by universities (based on internal procedures or national quality assurance mechanisms) have been applied to micro-credentials. This is essential for micro-credentials bearing ECTS points. However, the appropriate quality assurance in line with the Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG) should also be adopted. Regardless of the approach taken, the quality assurance process is the part of the ENHANCE micro-credential description.

It should be considered that the implementation of a complex quality assurance system for joint micro- credentials would be difficult, especially at the beginning of a project. It would, therefore, be more useful to agree on some basic standards and enhance them based on experience gained with pilot implementations. The problem of assuring quality of B-GREEN-ED joint micro-credentials should also be considered in a wider context when exploring future exploitaBon of the micro-credentials developed inside the project.

Inside the B-GREEN-ED project, micro-credentials have been conceived as stand-alone activities, though the university partners may consider recognizing univocally a specific set of online courses, depending on their own internal education strategy.

3. Quality Assurance Measurement. Qualitative and Quantitative Indicators

Quality assurance (QA) is any systematic process determining whether a product or service meets specified requirements. The ISO (International Organization for Standardization) is a driving force behind QA practices and mapping the methods used to implement QA. QA is often paired with the ISO 9000 international standard. The ISO 9000 family consists of the world's best-known standard for quality management systems (QMS), ISO 9001, and a set of supporting standards on quality management, all published by ISO/TC 176 and its subcommittees. Therefore, the measurement of Quality Assurance in the B-Green-ED projects helps us to guarantee the designing of micro-credentials that are clear of defects and meet the needs and expectations of target groups.

The following qualitative indicators were used to measure the level of the achievement of the objectives:

- relevance of the MC courses regarding the industry/sector skills sets demands and standards as well as the strategic goals and market needs at local/national/international level;
- quality and efficacy of the approaches and tools for information and data collecting;
- level of participation and appreciation of the piloting sessions;
- the quality of the feedback, data, and specific comments and suggestions collected during the piloting;
- level of satisfaction of the stakeholders involved in the piloting;
- transferability of the outcomes (courses and strategies);
- stackability and portability of the MC courses developed.

For evaluating the quality level of the outputs, and the achievement of the objectives the following quantitative indicators were considered:

- the number of target group representatives involved in the piloting;
- the number of questionnaires and data-collecting tools developed;
- the number of micro-credential e-courses' instances piloted and approved;
- the number of higher education micro-credential courses in standardization and management, environmental, and green standards registered in the online B-Green-ED Catalogue.

4. Structure, content and results of the satisfaction surveys for UPV and USVT

The MC courses in UPV and USVT were delivered between March and July 2024. **Table 3** and **Figure 1** provide the information about the exact number of participants in every micro-credential course, as well as the number of the participants in the satisfaction surveys.

	USVT-1	USVT-2	USVT-3	UPV-1	UPV-2	UPV-3
Total number of participants in each course	114	59	55	29	36	41
Total number of participants that completed the satisfaction survey	65	28	25	18	22	27
Ratio of participation in the satisfaction survey	57.0%	47.5%	45.5%	62.1%	61.1%	65.9%

Table 3. Participants and satisfaction surveys for every micro-credential course in USVT and UPV

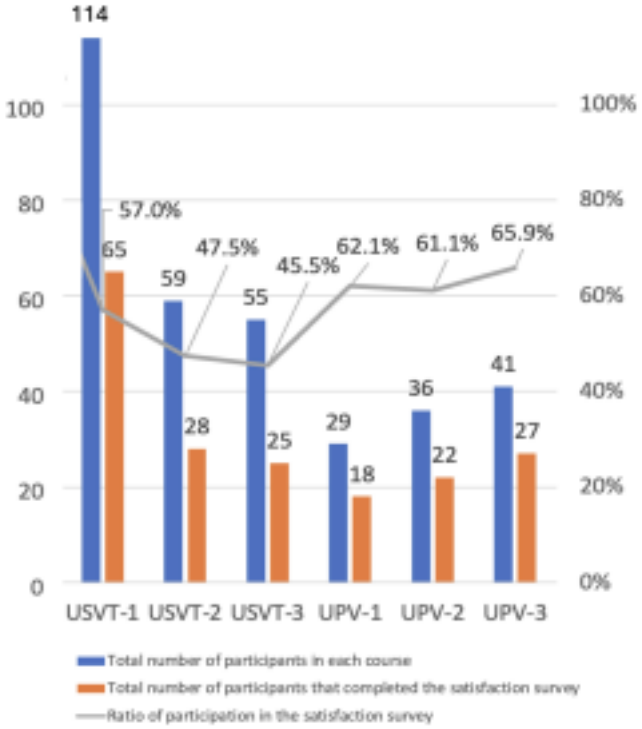

Figure 1. Participants and satisfaction surveys for every micro-credential course

A total number of 334 students have participated in the micro-credential courses organized by USVT and UPV during the B-Green-Ed project, largely exceeding the expectations. Besides, the overall ratio of participation in the satisfaction surveys is 56.51%, which is a very high value that provides robustness to the conclusions of the surveys.

The B-GREEN-ED satisfaction surveys include 11 different questions that are grouped inside 3 sections. Section 1 refers to design, structure, and feasibility and includes the following three questions:

- **Question 1.** - The course was well-designed and satisfied my need to learn more about European and international standards in ecology and management.
- **Question 2.** - The topics covered were relevant to the course, and the information was presented at an appropriate level of complexity.
- **Question 3**. - The micro-credential course has clear instructions and an easy-to-follow navigation structure.

Section 2 refers to relevance, viability, and overall satisfaction about the MC courses, and

includes the following three questions:

- **Question 4.** - This micro-credential course was engaging and interesting, providing useful and relevant information for my needs.
- **Question 5.** - Thanks to the course organized into micro-credits, I have a clear understanding of the subject.
- **Question 6.** - My expectations were met in this course organized on microcredits.

Finally, Section 3 refers to suitability, efficacy, and quality of the MC courses, and includes the following five questions:

- **Question 7.** - The course provided me with a significant amount of useful and practice-oriented information
- **Question 8.** - My knowledge and understanding related to the ecological and management standards of the European and international sector/industry addressed in the course improved and expanded.
- **Question 9.** - The online tools and facilities for interacting with my instructor and other classmates are easy to use.
- **Question 10.** - The recommended additional materials and resources are relevant and contribute to a deeper understanding of the concepts.
- **Question 11.** - The educational content was presented in a clear and easily understandable language with an appropriate level of difficulty.

Figures 2, 3 and 4 show the results of the satisfaction surveys organized by USVT and UPV and for sections 1, 2 and 3, respectively.

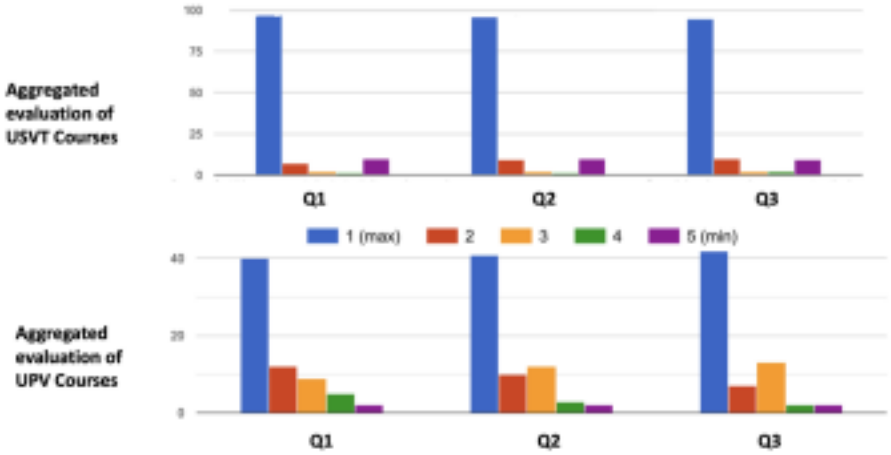

Figure 2. Satisfaction survey results for Q1, Q2 and Q3

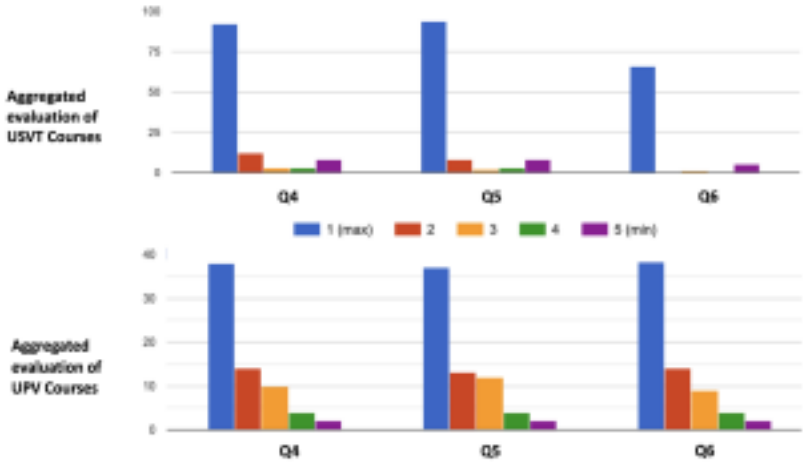

Figure 3. Satisfaction survey results for Q4, Q5 and Q6

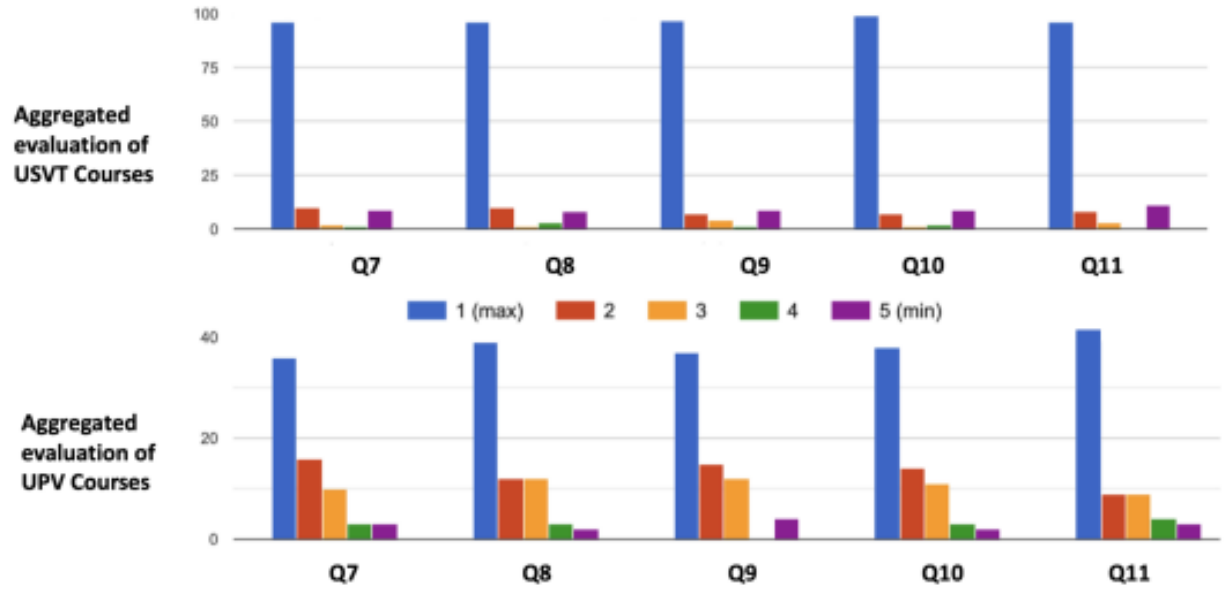

Figure 4. Satisfaction survey results for Q7, Q8, Q9, Q10 and Q11

5. Conclusions and Recommendations

Overall, the B-GREEN-ED courses have been very well-received, but there are still areas where improvements can improve the learning experience for future students. Participants (students, trainees) reported significant gains in specific skills relevant to their fields. They highlighted how these new competencies enhanced their personal and professional capabilities, making it easier to grasp and apply concepts quickly. Trainees pinpointed areas where they can become more engaged and develop berer strategies for learning. The practical and interactive aspects of the courses kept them highly engaged and motivated, encouraging improvements. The results of satisfaction surveys conducted by partner universities revealed several areas where micro-credential courses could be improved.

To enhance the quality of these programs, several recommendations have been put forward. One key area for improvement is the adaptation of course content to the specific needs of students. While the overall course design was well-received, some students expressed that the content did not directly address their specific requirements. To address this, it is recommended to conduct

pre-course surveys to gauge students' prior knowledge and expectations, and to offer multiple course tracks with varying levels of depth or focus on specific areas of interest. Additionally, clearly describing the proficiency level required for each topic within the course can help manage expectations. Another area for improvement is the selection of topics. Some students found the chosen topics to be less relevant to their interests or lacked the desired depth. To address this, it is recommended to examine student feedback to identify well-received topics and those that need improvement, and to consider adding guest lectures or expert interviews from different sub-fields. Additionally, offering students a choice of elective modules can allow them to customize their learning experience.

While the micro-credential format was generally well-received, some students expressed concerns about its effectiveness. To address this, it is recommended to conduct discussions or targeted surveys to gain insight into the reasons for these concerns, and to explore alternative micro-credential structures or add extra learning resources. It is also important to effectively communicate the advantages and learning outcomes associated with the micro-credential format to manage expectations. To enhance the practical application of micro-credential courses, it is recommended to evaluate student feedback to identify areas where the course could benefit from including more hands-on exercises or case studies, and to make explicit the practical skills students will acquire by the end of each module or unit.

Finally, providing additional materials such as industry reports, real-world application examples, or opportunities for project-based learning can enhance the learning experience and provide students with valuable practical experience. Overall, the survey highlighted several areas where the course could be improved to meet the needs of students and improve the learning experience. By implementing these recommendations, micro-credential courses can become even more effective in providing students with the knowledge and skills they need to succeed in the labor market.

References

D. Orr, M. Pupinis, and G. Kirdulyte, Towards a European approach to micro-credentials: a study of practices and commonalities in offering micro-credentials in European higher education, NESET report, Publications Office of the European Union, Luxembourg 2020.

Carțiș A, Leoste J, Iucu R, Kikkas K, Tammemäe K, Männik K (2022). Conceptualising micro-credentials in the higher education landscape. A literature review. Conference on Smart Learning Ecosystems and Regional Development, 191-203, Springer Nature Singapore.

European Commission. (2022, June). *A European approach to micro-credentials*. Retrieved from https://education.ec.europa.eu/education-levels/higher-education/micro-credentials.

European Commission (2020, September) Communication on Achieving the European Education Area by 2025, COM(2020) 625 final, European Commission, Brussels, 30.09.2020 https://ec.europa.eu/education/resourcesand-tools/document-library/eea-communication-sept2020_en.

European Commission (2020) Digital Education Action Plan 2021-2027: Resetting education and training for the digital age. https://ec.europa.eu/education/education-in-the-eu/digital-education-action-plan_e.

European Commission (2020, 30 June) European Skills Agenda for Sustainable Competitiveness, Social Fairness And Resilience, https://ec.europa.eu/social/main.jsp?catId=1223.

European Commission, Directorate-General for Education, Youth, Sport and Culture. Background note: Targeted consultation with rectors of European Universities, 27 April 2021.

International Federation of Standards Users. (2018). *IFAN Publications*. Retrieved from Guide 4:2018 Education and Training about Standardization (Updated 2018 and corrected by corrigenda 1): https://www.ifan.org/Final_Paris_IFAN%20Guide%204_V1.pdf.

Micro-credentials and Bologna Key Commitments State of play in the European Higher Education Area, MICROBOL, February 2021, https://microcredentials.eu/wp-content/uploads/sites/20/2021/02/Microbol_State-of-play-of MCs-in-theEHEA.pdf.

Micro-Credentials Higher Education Consultation Group: A European Approach to Micro-Credentials: Output of the, December 2020 https://ec.europa.eu/education/education-in-the-eu/european-education-area/a-european approach-tomicro-credentials_en.

Micro-Credetials Higher Education Consultation Group: A European Approach to Micro-Credentials: Output of the, December 2020, https://ec.europa.eu/education/education-in-the-eu/european-education-area/a-european approach-tomicro-credentials_en.