

Promoting the circular economy among urban youth through the EELISA digital credential and badges system: The CIRCULAR IN PLAY Project

Promoción de la economía circular entre los jóvenes a través del sistema de credenciales e insignias digitales EELISA: El proyecto CIRCULAR IN PLAY

Imge Akcakaya Waite¹, Antonia Pacios Álvarez², Justo García Navarro³
imgeawaite@itu.edu.tr, antonia.pacios@upm.es, justo.gnavarro@upm.es

¹Urban and Regional Planning
Istanbul Technical University
Istanbul, Turkey

²Aerospace Systems, Air Transportation
and Airports, ETSIAE
Universidad Politécnica de Madrid
Madrid, Spain

³Agroforestry Engineering,
ETSIAAB
Universidad Politécnica de Madrid
Madrid, Spain

Abstract- Building on the premise that sustainability and the circular economy are increasingly becoming a prospect in urban communities and among youth and thus higher education, this study investigates the novel educational activity recognition system of the EELISA European University, which is designed to encourage students from technical universities in and outside Europe to adopt sustainability-driven attitudes and behavior. More specifically, it examines the digital badges recognition framework in the recent case of the CIRCULAR IN PLAY project conducted by the Circular EELISA Community's international and interdisciplinary university collaboration. After an introduction of the EELISA framework and its badge system, the case project is examined in terms of how it links different learning activities to the learning objectives of specific Sustainable Development Goals and expected EELISA impact levels, followed by a critical analysis of implications and recommendations for further promoting circularity and sustainability among youth through international higher education alliances and networks.

Keywords: *Sustainability education, credential system, digital badges, circular economy, EELISA European University, CIRCULAR IN PLAY*

Resumen- Siguiendo la premisa de que la sostenibilidad y la economía circular se están convirtiendo en tendencia entre las comunidades urbanas, los jóvenes y, por tanto, la educación superior, este estudio investiga el sistema de reconocimiento de actividades de la Universidad Europea EELISA, diseñado para animar a los estudiantes de universidades técnicas a fomentar un pensamiento y un comportamiento impulsados por la sostenibilidad. Analiza concretamente el marco de reconocimiento de credenciales digitales en el proyecto CIRCULAR IN PLAY desarrollado por la Comunidad Circular EELISA. Tras presentar el marco de EELISA y su sistema de credenciales, se presenta el proyecto, cómo vincula las diferentes actividades de aprendizaje con los objetivos de aprendizaje de los ODS específicos y los niveles de impacto esperados de EELISA; sigue un análisis crítico para revelar las implicaciones y recomendaciones hacia una mayor promoción de la circularidad y la sostenibilidad entre los jóvenes en educación superior.

Palabras clave: *Educación para la sostenibilidad, sistema de credenciales, insignias digitales, economía circular, Universidad Europea EELISA, CIRCULAR IN PLAY*

1. INTRODUCTION

With the significant changes our world is undergoing today, sustainability is becoming a major focus in all sectors, and the concept of the circular economy is playing a crucial role in shaping a shift towards sustainable communities in urban areas. The circular economy is “restorative and regenerative by design” and aims to “keep products, components, and materials at their highest utility and value at all times” (Ellen MacArthur Foundation, 2023). It is a departure from the traditional linear economy, where resources are extracted, processed, used, and then discarded as waste, towards circularity, in which resources are kept in use for as long as possible through recycling, reusing, repurposing, etc., thus reducing the need for new resource extraction. In the context of urban development and engineering, a circular economic approach promotes sustainable practices in fields such as energy efficiency and renewable energy, waste management and recycling, sustainable transportation, green building and urban design, and collaborative consumption and the sharing economy (Joensuu et al., 2020). In this light, not only must urban management structures and development methodologies adapt to sustainability and circularity, but several fundamental social and cultural changes that accompany sustainable developments are also unavoidable (Moreau et al., 2017). These shifts include increased environmental consciousness of individual and collective impacts on the planet; emphasis on collaboration and the engagement of various stakeholders, including local communities; a shift towards mindful consumption that favors durability over disposability; the adoption of alternative lifestyles that prioritize environmental and social well-being; education and awareness programs across schools, higher education, and community organizations; and an appreciation for cultural diversity and heritage in creating vibrant and resilient communities.

In this new landscape, the demands of youth have weighed in to accelerate sustainable styles of living and education. Sustainable developments inspire youth to adopt practices such as minimalism, zero waste living, veganism, and renewable energy use better than older generations in their everyday lives

as well as their academic work. More than ever, schools and universities are attempting to integrate sustainability into their curricula and initiatives to match these changes (Sengupta et al., 2020). The resulting increases in education and awareness feed into a cultural shift towards the circular economy from an early age, shaping the values and behaviors of future generations. As the demand for sustainable and circular solutions and technologies increases, there will also be a cultural shift towards encouraging and supporting innovation in sustainable practices and a transformation of societal norms, values, and behaviors to foster a culture that embraces sustainability as a fundamental aspect of daily life. This paper adopts such a conception of circularity in discussing and harnessing sustainability among youths to promote circular urban communities. As such, this understanding is the basis of the European Engineering Learning Innovation and Science Alliance's (EELISA) Circular EELISA Community, which aims to promote all facets of sustainability across Europe.

This study focuses on the EELISA European University's educational activity recognition system, which aims to attract and motivate students from technical universities to adopt a mindset and behavior that prioritize sustainability. The study specifically investigates the utilization of a digital badges recognition framework in the case of the CIRCULAR IN PLAY project conducted by the Circular EELISA Community's international and interdisciplinary university collaboration between September 2022 and March 2023. The introduction of the study outlines the EELISA framework, which serves as a comprehensive structure for educational activities, and its badge system, which recognizes and rewards students for their achievements and contributions in the sustainability-related endeavors of EELISA communities and projects. The case project is then examined in detail through an exploration of how it links different learning activities to specific learning objectives aligned with Sustainable Development Goals (SDGs) and expected EELISA impact levels. Following the evaluation of the case project is a critical analysis to determine the lessons learned from the project experience and provide insights and recommendations for further advancing the concepts of circularity and sustainability among young individuals through international higher education alliances and networks.

2. CONTEXT & DESCRIPTION

A. *EELISA European University and the Circular EELISA Community in this ecosystem*

EELISA is the first alliance of higher education institutions from different countries in Europe, comprising graduate engineering schools, technology universities, and full-spectrum universities, whose goal is to define and implement a common conception of the European engineer. The alliance strives to promote the growing role of universities in identifying and helping to solve challenges facing their societies (EELISA, 2021). Nine higher education institutions are committed to renewing the time-honored tradition of public service through a wide range of initiatives where students, faculty, researchers, and other staff take part in real-world projects.

To date, 46 communities have been established, all working towards the same goal—to develop a common profile of the European engineer that can be defined through four general pillars: a high level of scientific, theoretical, and digital skills;

a desire to address issues of sustainability; interculturalism; and business and communication skills and critical thinking (i.e. practical and applied knowledge). Those who conform to the EELISA European engineer profile may develop through a combination of different life experiences, acquired knowledge, and exposure to real and changing world problems, constraints, and social context and should be mindful of the ethical consequences of engineering solutions and trained to understand and communicate with other professionals in diverse cultures and environments.

The Circular EELISA Community currently comprises the four universities of the EELISA alliance: the Technical University of Madrid, Istanbul Technical University, University Politehnica of Bucharest, and the Sant'Anna School of Advanced Studies. Its membership includes a total of 62 professors and researchers from these institutions and 35 external partners. The mission of the community is to develop resources for an integral approach towards the circular economy by addressing social, civic, and sustainability—or green—(SOCg) competence gaps in future professionals (Circular EELISA Community, 2021). The community's broader purpose is to trigger systemic change through a socio-civic approach to circularity, with the understanding that the circular economy requires not just technical solutions, but also the incorporation of transversal competences and a multidisciplinary approach (Circular EELISA Community, 2021).

From its initiation in 2021, the Circular EELISA Community's main objective has been to develop resources for an integral approach to the circular economy by addressing socio-civic competence gaps. Consequently, the community plans to reimagine the concept of "socio-civic competence" as that of "SOCg". Reflections made and lessons learned during the community projects and activities concerning social and civic competences are framed to give future professionals a better understanding of the need for a circular approach.

B. *EELISA credentials and badges: SDGs, learning objectives, and impact levels*

An EELISA credential is a kind of box where students collect digital badges. EELISA badges, which are official digital awards granted by EELISA, are marks of recognition collected through activities carried out by EELISA communities. A learner only collects badges through participation in activities; however, the credential is established with the collection of the first badge and is progressively enriched through participation in EELISA community activities. In other words, the credential is an incremental process that requires interested participants to attend multiple EELISA activities in order to collect enough badges that are later translated to European Credit Transfer and Accumulation System (ECTS) credits and reflected in their transcripts and degrees. Badges can be issued to any and all participants of an EELISA activity, regardless of their institution—EELISA or non-EELISA, within or outside of Europe—and independent of their academic status, whether bachelor, master, PhD, post-doc, alumna/alumnus, or non-student.

Each EELISA badge is characterized by three features: (1) one Sustainable Development Goal (SDG) defined by the United Nations, (2) one SDG-related learning objective, and (3) one EELISA impact level (Figure 1). These features are defined separately for each activity by activity designers and/or

coordinators and approved by the community coordinator. In designing badges, activity designers/coordinators are expected to assign SDGs, learning objectives, and EELISA impact levels most appropriate to the activity. In doing so, they are also encouraged to consult the “EELISA credential tool for activity designers,” a guiding document prepared by the EELISA Office with detailed feature descriptions and samples. For one activity, up to two SDGs can be considered for badge issuance, with up to two impact levels per SDG. In case of consecutive activities within a project, the badges are expected to incrementally increase in EELISA impact levels. The design of an EELISA badge reflects the SDG and the EELISA impact level attained.

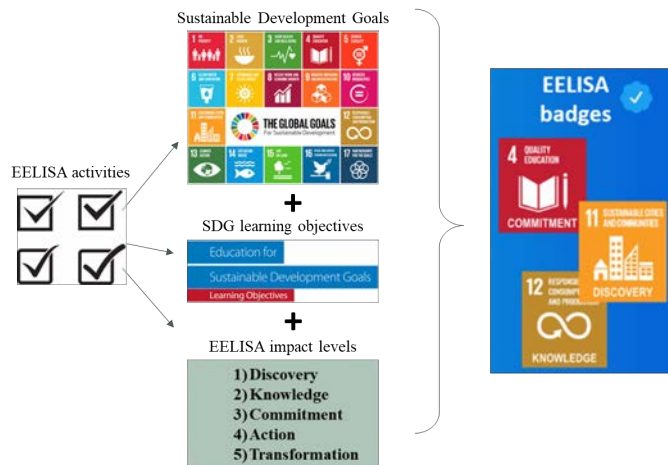


Figure 1. Components of EELISA digital badges

Once an activity is completed and the coordinators have gathered activity participants’ data, they fill out an “EELISA credential data collection template for badges” prepared by the EELISA Office. This template is a table that collects basic information about the activity and the eligible students, as well as the aforementioned badge features. The badge table is later digitally approved by the community coordinator, the activity coordinator’s (or activity host’s) university’s academic coordinator, and EELISA. Approved badges are delivered to activity participants by the EELISA office via email.

3. RESULTS

Conducted over a seven-month period ending in March 2023, CIRCULAR IN PLAY is among the pioneering educational activity projects of the Circular EELISA Community, as well as the EELISA Alliance. Through the collaboration of the four universities of the community, it comprised a series of online game-based events and activities aimed at promoting awareness and understanding of the circular economy and related socio-civic competencies. By using online games as a medium, the project provided an interactive and engaging platform for participants to learn about the basics of the circular economy. By incorporating the EELISA Alliance into the project, participants could benefit from increased exposure to international events, innovative ideas, and diverse perspectives, thereby enriching their educational experience.

A. CIRCULAR IN PLAY project design: The six workshops

In all workshops, the primary target group consisted of first- and second-year university students from the four organizing universities and other EELISA Alliance member institutions. However, participants ranged from all levels of undergraduate and graduate programs, including professors, from the member

universities as well as across and beyond Europe. Three workshops were announced as an open call. The first workshop, 3VIA 2022, was held as part of European Researchers' Night 2022 and designed as a trivia game focused on the three main themes of the circular economy: reduce, reuse, and recycle. The second workshop, ScapeRoom, was held as part of Madrid Science and Innovation Week 2022 and involved a scientific parkour with challenges related to the circular economy and socio-civic skills. The third workshop, R-Express, was held during the week of Global Recycling Day 2023 and organized as part of the ATHENS Network course UPM127, focusing on the basics of the circular economy in the construction sector. During all three workshops, students were invited to further collaborate in a joint activity to design circular economy themed infographics (Figure 2). The result was three one-week circular infographics design workshops, in which interested students from all participating countries worked together to research and create infographics on select topics related to the circular economy and sustainability.

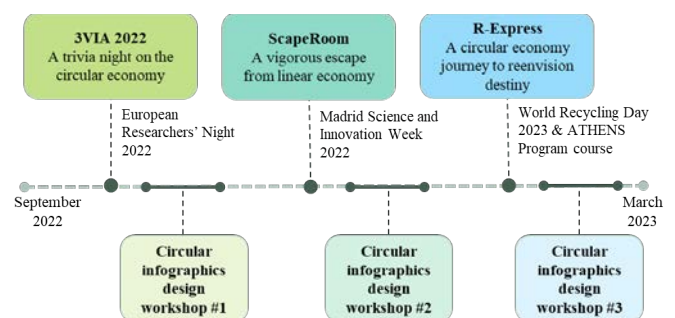


Figure 2. Workshops scheme of CIRCULAR IN PLAY

Overall, CIRCULAR IN PLAY housed 91 participants involving students from 13 universities in and beyond Europe, whereas 37 professors and researchers from the four universities contributed to organizing them. The collaborative approach of open workshops and more exclusive advanced workshops encouraged cross-cultural and interdisciplinary learning and provided an additional opportunity for higher education students to contribute their knowledge and perspectives. The game-based learning setting allowed students from different backgrounds and locations to actively engage in dynamic and fun challenges. The activities were designed to stir participants’ curiosity and interest in the circular economy.

B. Activity recognition: Badges and diplomas

Each workshop awarded participants with two digital EELISA badges with different combinations SDGs and EELISA impact levels—a recognition framework that fed into the game-based value of the project setting. A total of 12 badges were designed and distributed (Table 1). In line with the workshop topic and context, the four SDGs selected were SDG 4: Quality Education, SDG 11: Sustainable Cities and Communities, SDG 12: Responsible Consumption and Production, and SDG 13: Climate Action. Although the SDG-specific learning objectives differed for each workshop, the six-workshop bundle included cognitive, socio-emotional, and behavioral learning objectives of SDGs. Based upon the judgment of the Circular EELISA Community and UNESCO’s (2017) “Education for Sustainable Development Goals: Learning Objectives” document referenced by EELISA, the SDGs’ cognitive learning objectives corresponded to the EELISA impacts (1) discovery and (2) knowledge; the socio-emotional learning objectives corresponded to the EELISA

impact (3) commitment; the behavioral learning objectives corresponded to the EELISA impact (4) action; and cumulatively, the outcomes of these objectives corresponded to the EELISA impact (5) transformation. The impact levels of 1 through 4 incrementally increased for the follow-up infographics workshops, in line with the badges framework.

Table 1. Badges breakdown for the CIRCULAR IN PLAY workshops

Activity	Date	Badge #	SDG		EELISA impact level
			SDG	learning objective	
3VIA 2022	Sep 30, 2022	1	4	3	1
		2	12	1	2
Circular infographics #1	Oct 24-30, 2022	3	4	2	2
		4	12	3	4
ScapeRoom	Nov 14, 2022	5	11	2	1
		6	12	4	2
Circular infographics #2	Dec 12-18, 22	7	11	2	3
		8	12	1	3
R-Express	Mar 18, 23	9	11	1	2
		10	13	3	1
Circular infographics #3	Mar 27-31, 23	11	11	4	3
		12	13	2	3

By integrating the SDGs into the badge system, the project highlighted the connections between the circular economy and various sustainable development objectives. The inclusion of SDGs and EELISA impact levels in the badges also indicated that the project sought to link participants' achievements with the objectives and values of the alliance. This framework assessed the participants' impact based on criteria related to educational mobility, innovation, and collaboration. By earning badges, participants could track their progress and contributions within the context of the EELISA Alliance.

C. Badges experience close-up: What worked and what can be improved

The combination of SDGs and EELISA impact levels in the badge system not only recognized individual achievements but also reinforced the game-based value of the project. Participating students expressed that the gamification of the recognition process motivated them to actively engage in the workshops, collaborate, and strive to earn different badges. This approach enhanced the overall experience by providing a sense of accomplishment and promoting a competitive yet collaborative atmosphere. Having to offer students credentials with a higher level of impact in consecutive workshops forced the organizers to rethink the activities and final results, in turn giving rise to an infographics-design activity with teams of reduced numbers of students with greater commitment, and strengthening the role of the facilitators.

The digital badges system can benefit from association with other robust recognition types, such as ECTS credits; such association would set a course recognition standard and encourage students in higher education to attend both in-person and online events to earn academic qualifications and engage in study periods abroad (European Commission, 2015). This way, badges can be accumulated as micro-credentials that apply towards degree fulfillment—an agenda of EELISA that is

currently being developed. Digital badges can also be utilized as a gateway in graduate program admissions, particularly for programs that are aligned with global visions of sustainability. Last but not least, activity announcements may highlight the type of badges and credentials to be awarded, so that students can design their mobility itinerary based on desired SDGs, levels of impact, or learning outcomes.

4. CONCLUSIONS

This study reviews the novel educational activity recognition framework of the EELISA European University, with a specific focus on the digital badges recognition system utilized in the CIRCULAR IN PLAY project. A critical examination of the case project has indicated that the digital badge system aligned participants' achievements with sustainability objectives and the values of the EELISA Alliance while adding a game-based element to the project. The lessons learned from the project call for the further integration of existing recognition systems and that of the digital badges with activity dissemination, program admission, and mobility processes. Consequently, EELISA digital badges may serve as a promising recognition model to be further utilized across Europe.

ACKNOWLEDGEMENTS

The CIRCULAR IN PLAY project was funded by the first EELISA Call for Joint inter-institutional Activities in Communities. The authors would like to thank the Circular EELISA Community, the participating academics, and the workshop participants, all of whom made this study possible.

REFERENCES

- Circular EELISA Community (2022). *What is Circular EELISA Community?* <https://blogs.upm.es/circulareelisa/about>. Accessed on 26 May 2023.
- EELISA (European Engineering Learning Innovation and Science Alliance) (2021). *What is EELISA? The EELISA European Engineer.* <https://eelisa.eu/what-is-eelisa/>. Accessed on 26 May 2023.
- Ellen MacArthur Foundation (2023). *The circular economy in detail: Deep dive.* <https://ellenmacarthurfoundation.org/%20the-circular-economy-in-detail-deep-dive>. Accessed on 20 May 2023.
- European Commission (2015). *ECTS users' guide 2015.* UC Directorate-General for Education, Youth, Sport and Culture.
- Joensuu, T., Edelman, H., & Saari, A. (2020). Circular economy practices in the built environment. *Journal of Cleaner Production*, 276, 124215.
- Moreau, V., Sahakian, M., Van Griethuysen, P., & Vuille, F. (2017). Coming full circle: why social and institutional dimensions matter for the circular economy. *Journal of Industrial Ecology*, 21(3), 497-506.
- Sengupta, E., Blessinger, P., & Yamin, T. S. (Eds.). (2020). *Integrating sustainable development into the curriculum.* Emerald Group Publishing.
- UNESCO (2017). *Education for sustainable development goals: Learning objectives.* UNESCO