R.5.2. 4 coauthored journal articles

for the Project Education 4.0: Living Labs for the Students of the Future (LLSF)

Contract number 2021-1-RO01-KA220-HED-000032176

Project:	Education 4.0: Living Labs for the Students of the Future (LLSF)
Action Type:	KA220-HED - Cooperation partnerships in higher education
Contract number:	2021-1-RO01-KA220-HED-000032176
Responsible:	National University of Science and Technology POLITEHNICA Bucharest

List of participants

Participant No *	Participant organisation name	Acronym	Country
1 (Coordinator)	National University of Science and Technology POLITEHNICA Bucharest	UNSTPB	RO
2	Universidade NOVA de Lisboa	NOVA	PT
3	Universita Politecnica delle Marche	UPM	IT
4	Universidad Nacional de Education a Distancia	UNED	ES
5	Tel Aviv University	TAU	IL

Revision history:

Rev	Date	Partner	Description	Name
1	23/Jan/2025	UNED	First draft	Emmanuelle Gutierres y Restrepo

Disclaimer

The information in this document is subject to change without notice. Company or product names mentioned in this document may be trademarks or registered trademarks of their respective companies.

During the project, several research papers were published:

Zamiri, M., Sarraipa, J., Ferreira, J., Lopes, C., Soffer, T., & Jardim-Goncalves, R. (2023). A **Methodology for Training Toolkits Implementation in Smart Labs**. *Sensors*, *23*(5), 2626. https://doi.org/10.3390/s23052626

Abstract

Globally, educational institutes are trying to adapt modernized and effective approaches and tools to their education systems to improve the quality of their performance and achievements. However, identifying, designing, and/or developing promising mechanisms and tools that can impact class activities and the development of students' outputs are critical success factors. Given that, the contribution of this work is to propose a methodology that can guide and usher educational institutes step by step through the implementation of a personalized package of training Toolkits in Smart Labs. In this study, the package of Toolkits refers to a set of needed tools, resources, and materials that, with integration into a Smart Lab can, on the one hand, empower teachers and instructors in designing and developing personalized training disciplines and module courses and, on the other hand, may support students (in different ways) in developing their skills. To demonstrate the applicability and usefulness of the proposed methodology, a model was first developed, representing the potential Toolkits for training and skill development. The model was then tested by instantiating a particular box that integrates some hardware to be able to connect sensors to actuators, with an eye toward implementing this system mainly in the health domain. In a real scenario, the box was used in an engineering program and its associated Smart Lab to develop students' skills and capabilities in the areas of the Internet of Things (IoT) and Artificial Intelligence (AI). The main outcome of this work is a methodology supported by a model able to represent Smart Lab assets in order to facilitate training programs through training Toolkits.

Dias, J. Sarraipa, T. Soffer, R. Goncalves, N. Martins, F. Luis-Ferreira (2024) **BRIDGING THE GAP: FOSTERING DIGITAL INCLUSION AND SOFT SKILLS IN STEM EDUCATION**, EDULEARN24 Proceedings, pp. 7178-7187, DOI:10.21125/edulearn.2024.1699.

Abstract:

In the rapidly advancing domains of Science, Technology, Engineering, and Mathematics (STEM), equipping students with interpersonal skills is equally vital as their technical education. Facing the challenges posed by the new era of socioeconomic development driven by digital reforms, this article explores the adaptive strategies educational institutions must undertake to prepare students for a future where digital inclusion is paramount. Such endeavour requires not only a transformation in teaching methodologies and attitudes of educators and learners but also the development of approaches to mitigate the social inequalities exacerbated by digital transformation, ensuring balanced access to technological resources for all students.This

study provides a detailed analysis of the activities within the Soft Skills for Science and Technology course (CTCT) offered at NOVA School of Science and Technology. The course aims to equip science and engineering students with essential non-technical skills, covering areas such as employability, time management, teamwork, leadership, information management and communication in science, ethics, and deontology, alongside advanced spreadsheet usage. The present research aims to suggest targeted modifications to enhance the course's effectiveness. Furthermore, it addresses critical questions regarding the key competencies required by 21st-century engineers and scientists and the most effective methods for acquiring these skills in a higher education setting. It also seeks to identify the crucial ethical issues that should be integrated into engineering education. Drawing upon an extensive review of literature in cognitive psychology and educational research, the analysis identifies discrepancies between existing pedagogical practices and optimized teaching strategies informed by contemporary understandings of learning processes. Despite the goal of fostering a broad range of transversal skills, current implementations may fall short in maximizing the enduring acquisition and application of these skills, especially in situations characterized by technological disparities. The innovation proposed in this document consists of a suite of evidence-based recommendations for refining the mentioned course. These suggestions aim not only to enhance the educational experience, in developing interpersonal skills within STEM fields but also to foster greater digital inclusivity. The findings aim to contribute to the scholarly discourse on the efficacy of educational methodologies in higher education, particularly in meeting the challenges of the current socio-technical landscape, thereby facilitating a holistic integration of transversal skills into the science and engineering curricula.

Nazarenko, A., Marcelino-Jesus, E., Sarraipa, J., Y Restrepo, E. G., Zamiri, M., & Flynn, T. (2024). **Inclusive Sustainability: Strategies for Sustainable Digital Solutions in the Twin Transition for Vulnerable Communities**. In Proceedings of the 30th ICE IEEE/ITMC Conference on Engineering, Technology, and Innovation: Digital Transformation on Engineering, Technology and Innovation, ICE 2024 (Proceedings of the 30th ICE IEEE/ITMC Conference on Engineering, Technology, and Innovation: Digital Transformation on Engineering, Technology and Innovation, ICE 2024). Institute of Electrical and Electronics Engineers (IEEE). https://doi.org/10.1109/ICE/ITMC61926.2024.10794329 https://novaresearch.unl.pt/en/publications/inclusive-sustainability-strategies-for-sustainable-digital-solut

Abstract

Inclusive sustainability for vulnerable communities in the context of the digital twin transition necessitates a holistic approach that considers socio-economic disparities, cultural sensitivities, and accessibility barriers. By actively involving marginalized social groups in the design, implementation, and governance of digital twin initiatives, stakeholders can foster empowerment, resilience, and social cohesion. Strategies for inclusive sustainability must bridge the digital divide, enhance digital literacy, and promote participatory decision-making processes, while addressing systemic inequalities and promoting social justice. By prioritizing the needs and voices of vulnerable

communities and embracing sustainability principles, societies can leverage digital twin technologies to create a more resilient, equitable, and sustainable future for all.

 Abstract

The construction sector is developing rapidly around the world, to the extent that companies are actively exploring opportunities with emerging technologies. However, the construction sector is the lowest-ranked economic sector in terms of digital adoption in Europe and with a lot of opportunities to explore, according to a leading EU industry organization. In addition, being one of the sectors that creates the most waste, and with EU intending to reduce waste and the use of virgin raw materials, it is important to start implementing solutions to mitigate the waste volume. This paper presents a solution that tracks materials from production to installation in the construction site, making it possible to identify where the materials are delivered, and whether they are delivered on time and control the quality of the materials. Giving the ability to reduce waste, excessive use of materials will improve construction quality. This paper demonstrates the connection between different suppliers and the construction company, and serves as a good example of good practice of IoT use to monitor the production of materials and delivery to the construction site, validating the innovative concept between Edge to the Cloud. The result was the development of a solution centralised in the Cloud and interconnected with solutions installed in factories (Edge solutions) with support for sensors to be able to monitor production in real-time, to provide updates on the status of production, and identify whether possible delays in materials have an impact on construction deadlines.