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SEFI POSITION AND LONG-TERM PLAN ON
LIFELONG LEARNING

Drivers for Lifelong Learning (LLL) in Engineering Education

Engineering is recognised as playing a crucial role in delivering the UN Sustainable Development Goals (UNESCO, 2021) and contributing to responsible socio-economic development (EWB, 2022; Maloney and Caicedo, 2022). An updated set of competences needs to be nurtured and maintained by engineers throughout their working life to allow them to contribute to responsible innovation, development, and use of current and emergent technologies and systems.

At present, there are around 17 million engineers in the European Union (Eurostat, 2018), as well as approximately 5 million students in engineering, manufacturing, construction, mathematics, natural sciences, information, and communication (Eurostat, 2024). Despite these numbers, there remains a shortage of engineers at a time when the lack of sustainability/green and digital skills (European Commission, 2023) has a negative impact on economic growth and is hindering the timely transition to a green economy (Engineers4Europe, 2024; European Commission, 2024a).

Recruitment into, engagement with, and retention in engineering are not the only concerns. Engineers graduating from universities today may work for more than 40 years, seeing several changes in career (not just changes in job roles) in response to evolving societal and economic needs. Consequently, further and higher education institutions, employers, and professional organisations need to equip engineers across their careers with competences to keep them productive and engaged in the engineering labour market. Additionally, engineers need suitable developmental opportunities to support their technical and professional development, by maintaining proficiency of their competences (knowledge, skills, and behaviours), and enabling them to anticipate change. This need for development is equally true for all stakeholders in engineering education, whether faculty and educators in higher and further education institutions or others that support and enable the development of engineers.

Therefore, a key focus of continuing engineering education (CEE) needs to be on providing lifelong learning (LLL) opportunities that nurture engineers throughout their careers and seek to retain their expertise within engineering through meaningful development.

UNESCO Institute of Lifelong Learning (2024) defines LLL as being:

> *rooted in the integration of learning and living, covering learning activities for people of all ages (children, young people, adults and the elderly, ...), in all life-wide contexts (family, school, the community, the workplace, and so on) and through a variety of modalities (formal, non-formal and informal), which, together, meet a wide range of learning needs and demands*

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For LLL, the OECD highlights that a systemic approach is required, centred on the learner and their agency (OECD, 1996; cited in Naimpally, Ramachandran and Smith, 2012), indicating that:

- In engineering, learning is an ongoing, career-wide process;
- Engineering has a global nature.

Therefore, a systemic, collaborative approach across stakeholders such as policy makers, education institutions, employers, and professional associations is required to support the LLL of engineers.

At a policy level, the importance of LLL is recognised by the EU as providing "the ongoing access to the renewing of skills and the acquisition of knowledge" (European Commission, 1995) and, more recently, to enable competitiveness in Europe (European Commission, 2024b). Unfortunately, the policy and rhetoric are not reaching their full potential due to uncertainty around how best to implement and embed policy in operational structures and systems, and how to strategically approach this in long-term planning. This opportunity for efficient, pan-European approaches is impacted by national policy and regulatory differences in governance, funding, and priorities around LLL.

Opportunities do exist for a more effective and efficient ecosystem in Europe. Some solutions may be enabled by technology, such as generative AI's promise, for example, in allowing for extremely personalised learning. Moreover, technology facilitates international discussions and learning, which both enhances individuals' global perspectives when engaging in LLL and enables virtual communities and effective knowledge sharing. However, the impact of these technologies and other disruptive forces and events on the current LLL ecosystem needs to be carefully mapped out. Other solutions may emerge from a better understanding of how LLL is funded and promoted in different countries, and how these differences enable or hinder the adoption of progressive LLL policies and their successful implementation at the national and institutional levels.

What is evident, however, is that we can achieve a more effective LLL ecosystem if coordinated, collaborative efforts are made on an international level to support institutions and countries in sharing and co-creating agile and flexible solutions for CEE and LLL implementation.

SEFI, as a community of educational and technological experts, stands as a key organisation that can respond to this changing landscape.

Interested Groups – Lifelong Learning in Engineering

There is a range of interested groups (Naimpally, Ramachandran and Smith, 2012) throughout an engineer's life that help with formation, development, progression, and career transition, utilising a range of forms of LLL (Figure 1). Engineers design, develop, deploy, and sustain solutions that respond to society's needs and wants. Societal needs will change based on macro-economic factors - such as political, economic, regulatory, (inter)national challenges and opportunities, and these in turn influence and are responded to by governments and (inter)national organisations. The responses of these organisations set the wider context in which companies and engineers operate and influence competences that engineers need to develop and refine. Responses to these changes are seen in (1) educational policy and institutional strategies and actions, (2) in how professional bodies, such as national professional engineering institutions and licensing/regulatory institutions, refine their policies to encourage engineers to remain current, and (3) the actions and support that employers want and need from training organisations, suppliers and educational institutions to remain competitive. As illustrated, this may manifest as non-formal, informal, and formal efforts, which can together contribute to meeting needs beyond individual sectors or countries. Any systemic analysis or initiative in CEE and LLL have to take these different actors, as well as technology enablers, into account.
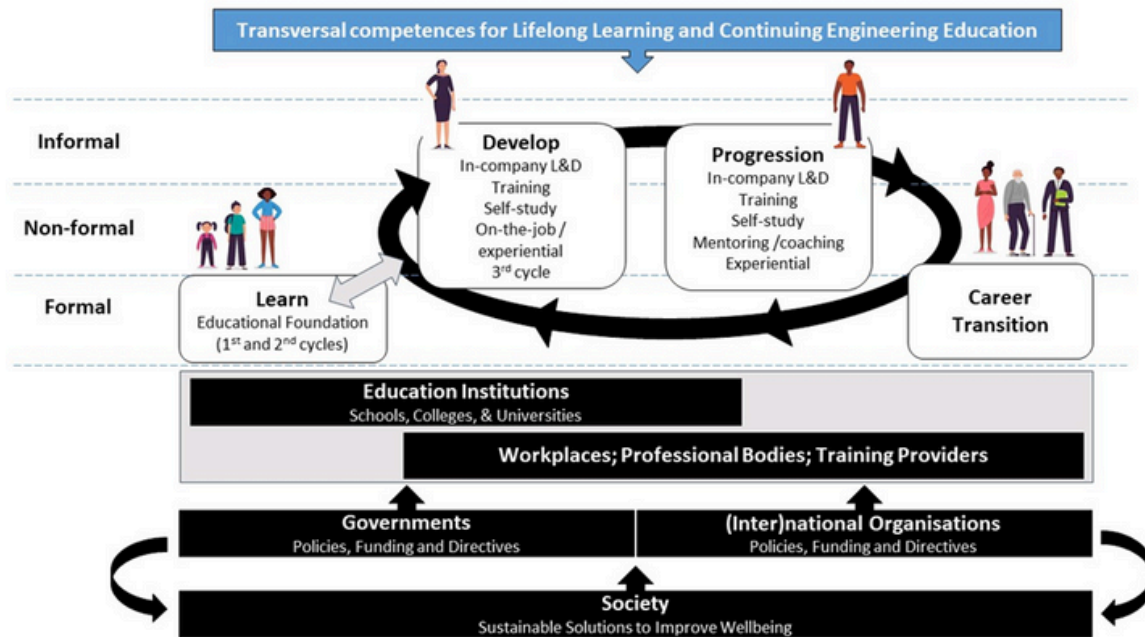
Figure 1: interested groups in lifelong learning (continuing education) in engineering across an engineer's career, reflecting the different forms of learning (formal, informal and non-formal) that they engage in as part of their professional development *(images in figure designed by tartila / Freepik)*

Role of Lifelong Learning in Achieving SEFI's Vision and Mission

SEFI, with its international partners, stands as a pivotal organisation in the international landscape with the expertise and remit to play a key and transformative role in this important area of engineering and engineering education. SEFI's mission is *"to contribute to the development and improvement of engineering education and to strengthen the understanding and knowledge of engineering education by bringing stakeholders together through the sharing of ideas, good practice, common goals, and experience"* (SEFI, 2024).

As outlined above, a collaborative, interdisciplinary, multi-stakeholder, and international approach is required to support the LLL of engineers.

SEFI already has a long-standing commitment to this through the Continuing Engineering Education and Lifelong Learning (CEE/LLL) Special Interest Group (SIG), founded in 1980. However, the nature of LLL is a transversal topic of potential relevance across SEFI. The envisaged scope of LLL in terms of SEFI is outlined in Figure 2.

In this context, continuing education is defined as the *"professional development activities in which an employee, typically with a completed academic degree, seeks further learning from a higher education institution"* (Friedman and Phillips, 2004).
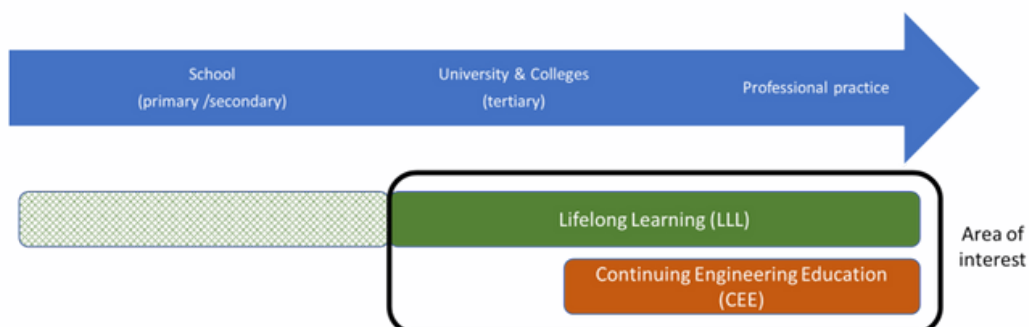

Figure 2: envisaged scope of focus for SEFI in Lifelong Learning and Continuing Engineering Education.

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This position paper advocates for a renewed strategic position for CEE and LLL within SEFI, which will bring together SEFI's expertise to contribute and drive the agenda around CEE and LLL in engineering education.

Specifically, we propose the following actions:

- For SEFI members to make an **active commitment** to CEE and LLL;

- For SEFI to recognise **LLL as an enabling competency in engineering**, and promote this position to engineers in the process of their training, education, to practising engineers, as well as to those who enable ongoing education and development (for example, Van den Broek et al., 2024a for an outline of LLL competences, and Van den Broek et al., 2024b about how to support faculty in nurturing LLL competences);

- For SEFI to issue a clear statement on CEE and LLL with the intent that it becomes a benchmark position to inform and underpin **policy decisions within European countries** and beyond;

- For SEFI, through its actions, members, and partners, to enable **the sharing of solutions and the co-creation of models** and tools to support and accelerate CEE and LLL, facilitated by a resource platform allowing:

  - To build a shared language to facilitate collaboration, building on the existing work within SEFI on taxonomy and frameworks;

  - To create an online repository of best practices in transforming engineering education in a LLL paradigm and in CEE practices;

  - To run knowledge-sharing events with other engineering education associations and societies;

  - To lead the co-creation and solution-focused workshops to support SEFI members;

  - To support educators and trainers with guidelines, methods and approaches to develop and upgrade their competencies to be able to upskill and reskill professionals in industry.

- For SEFI, together with its partners, to conduct an initial strategic review of developments in CEE and LLL. This review will be then updated on a biennial basis, focusing particularly on drivers, barriers and enablers, innovative practices, and opportunities for SEFI and its partners to influence and create impact at a (pan)national level. A more in-depth review will take place less frequently, and as motivated by the pace of changes in the field.

SEFI Special Interest Groups Leadership Role and Plans

To support the proposed actions, we suggest for:

- Relevant SIGs with an interest in CEE and LLL to **collaborate** on initiatives and projects, actively supported by SIG (Co)Chairs and the SEFI Board of Directors;

- The CEE/LLL SIG to lead the **development of a taxonomy** to enable sharing and codification of relevant approaches;

- The CEE/LLL SIG, together with the Capacity Building SIG, to **develop guidelines**, methods, and approaches to build the capacity of educators who **upskill and reskill professionals** in the working environment;

- The CEE/LLL SIG, with support from SEFI HQ, to lead the development of **a repository** to support excellence on the topic;

- SEFI to develop a stream of work on **digital technologies/AI** and their practical application and impact on CEE and LLL.

List of used abbreviations:
AI: Artificial Intelligence
CEE: Continuing Engineering Education
EU: European Union
HQ: Headquarters
LLL: Lifelong Learning
OECD: Organization for Economic Co-operation and Development
SEFI: European Society for Engineering Education
SIG: Special Interest Group
UNESCO: United Nations Educational, Scientific and Cultural Organization

Review and proposed use of this position paper

This position paper will be reviewed biennially by the relevant SIGs together with the SEFI Board of Directors.

It is intended to serve as input for SIG's annual planning, which will outline more detailed activities and expected outcomes.

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