

Glossary

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This chapter contains an alphabetical overview of all relevant terms and abbreviations used in the SEFI Handbook for Teaching Transferable Competencies and Skills in Engineering, their definitions, and where possible, their source, explained within a European education context. It aims to aid the reader in quickly accessing definitions for the most important terms used in this handbook.

ABET A non-profit USA-based organization that accredits college and university programmes in applied science, computing, engineering, and engineering technology. Known under the full name of Accreditation Board for Engineering and Technology until 2005 (ABET, 2005).

Academic staff Members of staff at a higher education institution that are primarily concerned with teaching and research and usually hold a degree themselves. In North America often referred to as faculty.

Accessibility *"The provision of flexibility to accommodate each user's needs and preferences; when used with reference to persons with disabilities, any place, space, item or service, whether physical or virtual, that is easily approached, reached, entered, exited, interacted with, understood or otherwise used by persons of varying disabilities, is determined to be accessible"* (United Nations, 2013, p. 3).

Accreditation *"The process by which a (non-)governmental or private body evaluates the quality of a higher education institution as a whole or of a specific educational programme to formally recognise it as having met certain pre-determined minimal criteria or standards. The result of this process is usually the awarding of a status (a yes/no decision), of recognition, and sometimes of a license to operate within a time-limited validity. The process can imply initial and periodic self-study and evaluation by external peers"* (Vlăsceanu et al., 2007, p. 25).

Accreditation standards see Programme outcomes.

Action Research (AR) Also referred to as 'practitioner research' or 'inquiry-defined research', meaning *"any systematic inquiry conducted by teachers, administrators, counsellors or others with a vested interest in the teaching and learning process or environment for the purpose of gathering information about their particular school's operation, how they teach and how their students learn. It is done by teachers for themselves as a systematic inquiry into their own practice"* (Mertler, 2024, p. 7).

Active listening *"Empathic responding using both words and actions, based on understanding the speaker's idea, attitude, and point of view, so that the listener senses how it feels to the speaker and grasps the speaker's frame of reference about the subject"* (Novick et al., 2021, p. 1).

Adaptability for change or change management A learner's adaptability involves identifying *"qualities which are critical for future performance and being both willing and able to make personal changes in order to meet those needs in a proactive way"* (Hall, 2002, in Hall & Chandler, 2005, p. 163).

AHSS Arts, Humanities, and Social Sciences.

Assessment The process used to evaluate the learner's progress and ascertain the achievement of the learning outcomes of an educational component (unit/module) using methods such as written, oral, and practical tests, examinations, projects, performances, presentations and portfolios (European Commission, Directorate-General for Education, Youth, Sport and Culture, 2015).

Autonomous motivation A synonym for intrinsic motivation, which refers to doing something because it is inherently interesting or enjoyable, or motivating oneself by focusing on positive external factors (Ryan & Deci, 2000).

Case study A case is “*a thing, a single entity, a unit around which there are boundaries*” (Merriam, 1998, p. 27 in Yazan, 2015) and can be a person, a program, a group, a specific policy, etc. A qualitative case study is “*an intensive, holistic description and analysis of a bounded phenomenon such as a program, an institution, a person, a process, or a social unit*” (p. xiii). There are different types of case studies: particularistic, i.e., focusing on particular situation, event, program, or phenomenon; descriptive, yielding a rich, thick description of the phenomenon under study; and heuristic, illuminating the reader’s understanding of a phenomenon under study.

Chartered Engineer A professional status granted by a recognised engineering body indicating the highest level of competence and expertise. Chartered Engineers are formally registered engineers who develop solutions to engineering problems using new or existing technologies, through innovation, creativity, and change, and often take technical responsibility for complex systems (The Institution of Engineering and Technology (IET), n.d.).

Collaboration A joint effort by multiple people towards a group goal (Briggs et al., 2006).

Constructive alignment An education design model based on a combination of constructivist theory and aligned instruction, in which teaching and learning activities and assessment tasks are in alignment with the intended learning outcomes to allow for deep engagement (derived from Biggs & Tang, 2011).

Continuous Professional Development (CPD) “*Formal in-service training undertaken by teachers or higher education staff throughout their career that allows them to broaden, develop and update their knowledge, skills and attitudes. It includes both subject-based training and pedagogical training. Different formats are offered such as courses, seminars, peer observation and support from networks of practitioners. In certain cases, CPD activities may lead to supplementary qualifications*” (European Commission: European Education and Culture Executive Agency, 2024, p. 217).

Course A course may be a self-contained, formally structured learning experience with learning outcomes, but is used interchangeably with *seminar, lecture, classroom activity, MOOC, subject, module*, or even *programme* (European Commission, Directorate-General for Education, Youth, Sport and Culture, 2015). As the word *course* is ill-defined, in this handbook we use the word *module* for a self-contained, formally structured, credit-giving component of a programme, usually covering a specific topic or theme, and the word *programme* to refer to a degree programme.

Curriculum The design, organisation and planning of programme activities, content and teaching of the elements that make up a programme, including the content to be covered, intended learning outcomes, and the teaching and assessment methods (Cedefop, 2024; European University Association, 2020).

Design Research (DR) In this handbook, Education Design Research refers to *“design and develop an intervention (such as programs, teaching-learning strategies and materials, products and systems) as a solution to a complex educational problem as well as to advance our knowledge about the characteristics of these interventions and the processes to design and develop them, or alternatively to design and develop educational interventions (about for example, learning processes, learning environments and the like) with the purpose to develop or validate theories”* (Plomp, 2013, p. 15).

Disability *“An umbrella term for physical, mental, or sensory impairments that, in interaction with environmental or societal barriers, limit a person’s ability to participate fully in activities. In other words, disability arises from the mismatch between individual functional impairments and inaccessible environments and thus is ‘not just one health problem’ but a complex phenomenon reflecting the interplay between a person’s condition and society”* (World Health Organization, n.d.).

Discipline-based education research *“An empirical approach to investigating learning and teaching that is informed by an expert understanding of disciplinary knowledge and practice”* (National Research Council, 2012, p. 11).

Dublin Descriptors *“[T]he cycle descriptors (or ‘level descriptors’) presented in 2003 and adopted in 2005 as the Qualifications Framework of the European Higher Education Area. They offer generic statements of typical expectations of achievements and abilities associated with awards that represent the end of each of a (Bologna) cycle or level. The descriptors are phrased in terms of competence levels, not learning outcomes, and they enable to distinguish in a broad and general manner between the different cycles. A level descriptor includes the following five components: 1) knowledge and understanding, 2) applying knowledge and understanding, 3) making judgements, 4) communication, 5) lifelong learning skills”* (European Commission Directorate-General for Education, Youth, Sport and Culture, 2015, p. 69).

EAFSG EUR-ACE Framework Standards and Guidelines (ENAE, n.d.).

Equity, Diversity, and Inclusion (EDI) Principles and practices ensuring that all individuals, especially those from historically underrepresented or marginalized groups, are valued and treated fairly. Diversity means the presence and representation of varied identities, perspectives, and backgrounds; equality (or equity) means providing fair treatment and equal opportunity to achieve outcomes; and inclusion means creating environments where everyone has a voice, feels respected, and can participate fully (Health and Care Professions Council, 2020).

European Credit Transfer System (ECTS) The system used by members of the European Higher Education Area (EHEA) to express *“the volume of learning based on the defined learning outcomes and their associated workload. 60 ECTS credits are allocated to the learning outcomes and associated workload of a full-time academic year or its equivalent, which normally comprises a number of educational components to which credits (on the basis of the learning outcomes and workload) are allocated. ECTS credits are generally expressed in whole numbers”* (European Commission,

Directorate-General for Education, Youth, Sport and Culture, 2015, p. 10). Table G.1 shows an overview of how credits from various parts of the world relate to each other using student workload.

Table G.1: Comparison of student workload expectations per credit for EHEA, UK, USA, Canada, and Australia (created by Nathans-Kelly)

<i>System</i>	<i>Credits per year</i>	<i>Student workload per credit</i>	<i>Notes</i>
EHEA	60 ECTS	20-30 hours	Used to standardise credits across EHEA.
USA	~30 credit hours	~45 hours	Focus on contact hours; varies per university and module type. 1 credit hour $\approx$ 1h contact + 2h independent study per week
UK	120 CATS	10 hours	2 UK CATS = 1 ECTS
Canada	~30 credit hours	~45 hours	Similar to USA
Australia	48 credit points	~25 hours	Varies per university; 1 CP $\approx$ 1 ECTS in some universities

Educational Design Research (EDR) “A genre of research in which the iterative development of solutions to practical and complex educational problems also provides the context for empirical investigation, which yields theoretical understanding that can inform the work of others” (McKenney & Reeves, 2018, p. 7).

Educational intervention An action, process, tool or event designed to promote learning. Examples include workshops that teach certain skills, restructuring a module to include lab sessions, teaching or instructional methods such as project-based learning, or revising the recruitment profile of teachers to require more industry experience.

European Higher Education Area (EHEA) A collaborative effort by 49 European nations, building on the main objective of the Bologna Process to create a more comparable, compatible, and coherent higher education system in Europe (European Commission, Directorate-General for Education, Youth, Sport and Culture, 2015).

European Network for the Accreditation of Engineering Education (ENAE) A non-profit network of agencies promoting quality engineering education, primarily by authorizing accreditation bodies to award the EUR-ACE label (ENAE, n.d.).

Engineering Council The regulatory authority in the United Kingdom responsible for establishing and upholding globally acknowledged benchmarks of professional competence and ethical conduct of engineers, which also governs the award,

awarding, and retention of the titles of Chartered Engineer as well as other titles such as Incorporated Engineers and Engineering Technician (Engineering Council, n.d.).

Engineering Education Research (EER) The field of disciplinary educational research focused on generating knowledge to define, understand, and improve how engineers are educated, encompassing research on pedagogy, assessment, diversity, policy, and learning (Loui & Borrego, 2019).

Engineers Europe A federation of national professional bodies representing engineering in European countries, formally known as the Fédération Européenne d'Associations Nationales d'Ingénieurs (FEANI) (Engineers Europe, 2022).

Epistemology The philosophical study of knowledge and knowing, that concerns the nature and justification of human knowledge (Hofer, 2001; Hofer & Pintrich, 1997).

EUR-ACE A European quality label authorised by ENAEE to professional engineering institutions who accredit engineering programmes (ENAEE, n.d.).

European Qualifications Framework (EQF) An eight-level, learning outcomes-based framework for all types of qualifications that serves as a translation tool between different national qualifications frameworks within the EHEA. EQF-level 6 is typically a bachelor degree, EQF level 7 typically refers to a master degree and EQF-level 8 to a PhD degree, also known as a doctorate (Cedefop, 2024).

Evaluation In education, this term refers to "*the systemic process of assessing the effectiveness and quality of educational programmes, teaching methods and student learning outcomes*" (UNESCO, 2026). In relation to student learning, it is often the point where a student's achievement is measured for validation purposes.

Evidence-based education The principle that education practices should be based on the best available scientific evidence, with randomised trials as the gold standard of evidence, rather than tradition, personal judgement, or other influences (Hargreaves, 1996).

Evidence-informed teaching "*A complex, situated professional practice that draws on a range of evidence and professional judgment, rather than being based on a particular form of evidence*" (Coldwell et al., 2017, p. 5).

External examiner Someone from outside a student's own school, college, or university who judges an exam (Cambridge Dictionary, 2025a).

Facilitation "*The provision of opportunities, resources, encouragement and support for the group to succeed in achieving its objectives, and to do this through enabling the group to take control and responsibility for the way they proceed*" (Bentley, 1994, p. 12).

Faculty In North America, this term is used to refer to "*the people who teach in a university, college, or US high school, or in one of its departments*", whereas in Europe the term is used to refer to "*a group of departments in a university or college that specialize in a particular subject or group of subjects*" (Cambridge Dictionary, 2025b).

In this handbook, we will avoid the use of the term *faculty* to refer to people and use the term *academic staff* instead.

Feedback *"A process through which learners make sense of information from various sources and use it to enhance their work or learning strategies"* (Carless & Boud, 2018, p. 1315).

Feedback literacy skills *"[T]he understandings, capacities and dispositions needed to make sense of feedback information and use it to enhance work or learning strategies"* (Carless & Boud, 2018, p. 1316).

First-cycle degree (FCD) The first step in the higher education degree cycle under the standardized EHEA framework for learners who have completed upper secondary education or equivalent. This is typically a bachelor level programme, lasting 3-4 years, requiring 180-240 ECTS to complete (European Commission, Directorate-General for Education, Youth, Sport and Culture, 2015; European Higher Education Area, 2018).

Framework In the context of this handbook, a framework is defined as *"a foundational structure — comprising concepts, theories, beliefs, or sets of rules — used to organize ideas, guide research, or plan curricula and instruction"* (Mccomas, 2014, p. 42).

Graduate A learner who has completed all programme deliverables and has been awarded a degree.

Graduate student A learner who already holds a first- and/or second-cycle or single-cycle degree and is enrolled in a second- or third-cycle degree programme, such as MSc and PhD students.

Graduate attributes A synonym for *programme outcomes*. In this handbook, we will use the term *programme outcomes*.

Higher education institution (HEI) *"Any institution providing services in the field of higher and/or tertiary education, as defined by national law"* (European Commission: European Education and Culture Executive Agency, 2024, p. 220).

Holistic engineering *"A cross-disciplinary, whole-systems approach to engineering education"* (Grasso & Burkins, 2010, p. 1).

International Engineering Alliance (IEA) *"A global collective of like-minded organisations focused on quality assurance in engineering education and professional competence. The organisation sets benchmark standards for engineering education and helps support engineers to work across borders and support sustainable communities"* (International Engineering Alliance, n.d.).

Inclusive education *"The ways in which pedagogy, curricula and assessment are designed and delivered to engage students in learning that is meaningful, relevant and accessible to all. It embraces a view of the individual and individual difference as the source of diversity that can enrich the lives and learning of others"* (Hockings, 2010, p. 1).

Information literacy skills *"A set of abilities to identify the need for information, find and evaluate it effectively, and use it in an ethical and legal manner to solve engineering problems. It underpins lifelong learning and supports the critical evaluation of automated information sources"* (ACRL, 2006).

Initiative *"Behavior characterized by its self-starting nature, its proactive approach, and by being persistent in overcoming difficulties"* (Frese & Fay, 2001, p. 134).

Interdisciplinarity This involves combining insights, methods, or approaches from two or more disciplines to address complex problems (Keestra & Menken, 2016; Klein, 2018).

Interpersonal communication skills — Adaptive communication ability The *"ability to reflect on one's own and others' perspectives to adjust communication choices for shared meaning"* (Leandro Cruz & Saunders-Smiths, 2019, p. 13).

Interpersonal communication skills — Interconnection/interrelation ability The *"ability to build trust and sustaining constructive relationships over time"* (Leandro Cruz & Saunders-Smiths, 2019, p. 13).

Interpersonal communication skills — Listening skills The *"ability to attend closely to verbal and non-verbal messages to ensure accurate interpretation."* (Leandro Cruz & Saunders-Smiths, 2019, p. 13).

Intervention *"A manipulation implemented by an external agent (i.e., teacher, researcher) that was intended to change students' cognitions, emotions, and/or behaviours"* (Lazowski & Hulleman, 2016, p.606).

Leadership skills The ability to create *"the environmental conditions conducive to good performance: support of shared understanding, innovation, problem-solving, resilience and learning"* (SEBoK, 2024).

Learning beliefs A person's subjective judgements about a relation between learning and his or her values or attributes (Fishbein & Ajzen, 1975).

Learner identity Individuals *"with a learning identity see themselves as learners, seek and engage in life experiences with a learning attitude, and believe in their ability to learn"* (Kolb & Kolb, 2009, p. 5).

Learning Outcomes (LO) *"Statements of what a learner knows, understands and is able to do on completion of a learning process. The achievement of learning outcomes has to be assessed through procedures based on clear and transparent criteria. Learning outcomes are attributed to individual educational components and to programmes as a whole. They are also used in European and national qualifications frameworks to describe the level of the individual qualification"* (European Commission, Directorate-General for Education, Youth, Sport and Culture, 2015, p. 10).

Learning path or **Programme path** *"The way in which learning is organised"* (translated from the legal Dutch term *"studietraject"*, as defined in Deel 1 – Titel 2 – Art. I.3. – 68° of the Codex Hoger Onderwijs, 2014), for instance through structures

which allow for students to encounter, experience, and reflect on their learning within a curriculum or degree programme, with the purpose of supporting students in developing a clearer sense of their emerging professional identity.

Learning strategies *"An individual's way of organizing and using a particular set of skills in order to learn content or accomplish other tasks more effectively and efficiently in school as well as in non-academic settings"* (Schumaker & Deshler, 1992, p.22).

Learning trajectory *"A well-argued progression of intermediate objectives and pedagogical content, directed toward a final goal. Depending on the precise function, context of application, and target group, these trajectories vary in the degree to which implications for various curricular components are operationalized"* (translated from Strijker, 2010, p.10).

Lifelong learning *"[A]ll learning activity undertaken throughout life, with the aim of improving knowledge, skills, and competences within personal, civic, social, and/or employment-related perspective"* (Commission of the European Communities, 2001, p. 33).

Meeting skills A set of teachable professional competencies that enable engineers to prepare for, participate in, lead, and follow up on meetings effectively. These skills extend beyond generic communication abilities, encompassing technical precision, facilitation strategies, structured decision making, documentation standards, and inclusive participation practices tailored to engineering environments (Galster et al., 2024; Changpueng & Pattanapichet, 2024).

Module A self-contained, formally structured, credit-giving educational component of a degree programme, usually covering a specific topic or theme (European Commission, Directorate-General for Education, Youth, Sport and Culture, 2015).

MOOC Massive Open Online Courses *"allow open entry and are delivered online usually with peer or automated support. They often have large enrolment numbers"* (European Commission, Directorate-General for Education, Youth, Sport and Culture, 2015, p. 73).

Ontology The philosophical study of being; it deals with how you view the world and reality, taking your assumptions about the nature of the world and reality into account (Easterby-Smith et al., 2012).

Open Educational Resources (OER) *"Digitised materials offered freely and openly for educators, students and self-learners to use and reuse for teaching, learning and research; it includes learning content, software tools to develop, use and distribute content, and implementation resources such as open licenses; OER also refers to accumulated digital assets that can be adjusted and which provide benefits without restricting the possibilities for others to enjoy them"* (European Commission, Directorate-General for Education, Youth, Sport and Culture, 2015, p. 74).

Oral presentation skills — Presentation skills The ability to give *"a clear, organised and logical speech and answers questions adequately and with elaboration"* (Leandro Cruz & Saunders-Smiths, 2019, p. 13).

Oral presentation skills — Quality of presentation method The ability to develop “*presentation methods and mediums depending on the topic and target group*” (Leandro Cruz & Saunders-Smiths, 2019, p. 13).

Oral presentation skills — Pitching skills The ability to “*convey and persuade audiences within a short 1-3-minute speech*” (Leandro Cruz & Saunders-Smiths, 2019, p. 19).

Peer assessment Different forms of educational activities in which students review and judge each other’s work and/or provide feedback to each other (Adachi et al., 2018; Fleckney et al., 2025; Topping, 1998).

Perseverance “*The quality or state of maintaining a course of action or keeping at a task and finishing it despite the obstacles (such as opposition or discouragement) or the effort involved*” (American Psychological Association, 2018a).

Positivism The idea “*that the social world exists externally, and that its properties should be measured through objective methods*” (Easterby-Smith et al., 2012, p. 22).

Problem-based learning (PBL) “*An instructional (and curricular) learner-centred approach that empowers learners to conduct research, integrate theory and practice, and apply knowledge and skills to develop a viable solution to a defined problem*” (Savery, 2006, p. 9).

Professional engineering institutions (PEI) Collective term for professional bodies and trade unions for engineers established to advocate for the advancement of the profession and the development of its members (The Welding Institute, n.d.).

Professional identity The way in which students see themselves as engineers-in-the-making, shaped by their motivations, beliefs, competences, and recognition from communities of practice (Chen et al., 2022, 2023).

Programme The degree programme that a student follows, leading to a formal qualification, usually at the bachelor or master level. In some contexts, this term can also refer to a fixed set of courses, subjects, or modules covering a single discipline, while it is a more flexible concept in other contexts. In this handbook, we use programme in the context of degree programmes only.

Programme evaluation Systematic assessment of a programme and its components to determine its quality or value. In this handbook, we use *programme evaluation* in the context of degree programmes only.

Project-based learning (PjBL) “*An inquiry-based instructional method that engages learners in knowledge construction by having them accomplish meaningful projects and develop real-world products*” (Guo et al., 2020, p. 2).

Project management skills On a process level, this refers to the ability to apply processes, methods, knowledge, skills and experience to achieve specific project objectives for change (Association for Project Management, 2024), according to the project acceptance criteria within agreed parameters.

Programme outcomes (POs) The discrete, observable outcomes expected of graduates upon completion of an accredited engineering programme. This term is also used as a synonym for *accreditation standards*.

Quality assurance *"The process or sets of processes adopted nationally and institutionally to ensure the quality of educational programmes and qualifications awarded"* (European Commission, Directorate-General for Education, Youth, Sport and Culture, 2015, p. 74).

Realism The belief that there is a single truth, and that facts exist and can be revealed through experiments (Easterby-Smith et al., 2012).

Representational literacy This addresses how visual-spatial thinking is externalised, communicated, and refined. It refers to proficiency in dynamically creating, interpreting, and managing visual language of engineering such as via technical drawings, schematics, free-body diagrams, and digital models (Johri & Lohani, 2011).

Resilience *"[T]he process and outcome of successfully adapting to difficult or challenging life experiences, especially through mental, emotional, and behavioural flexibility and adjustment to external and internal demands"* (American Psychological Association, 2018b).

Risk analysis and risk management skills The ability to carry out a risk analysis and manage and mitigate identified risks in engineering design and operations (NASA, 2007).

Scholarly teaching Teaching informed by the latest development on the discipline, as well as research about instructional design and how students learn in general or in a specific discipline (Dewar et al., 2018).

Scholarship of teaching and learning (SoTL) *"The systematic study of teaching and learning, using established or validated criteria of scholarship, to understand how teaching (beliefs, behaviours, attitudes, and values) can maximize learning, and/or develop a more accurate understanding of learning, resulting in products that are publicly shared for critique and use by an appropriate community"* (Potter & Kustra, 2011, p. 2).

Second-cycle degree (SCD) The second step in the higher education degree cycle under the standardized EHEA framework. This is typically a master-level programme, lasting 1 or 2 years, requiring 60 or 120 ECTS to complete. Entry requirement is usually a first-cycle degree or equivalent (European Commission, Directorate-General for Education, Youth, Sport and Culture, 2015; European Higher Education Area, 2018).

SEFI Société Européenne pour la Formation des Ingénieurs/European Association for Engineering Education (www.sefi.be).

Self-direction *"[A]n approach where learners are motivated to assume personal responsibility and collaborative control of the cognitive (self-monitoring) and*

contextual (self-management) processes in constructing and confirming meaningful and worthwhile learning outcomes" (Garrison, 1997, p. 18).

Self-reflection "[E]xamination, contemplation, and analysis of one's thoughts, feelings, and actions" (American Psychological Association, 2018c).

Self-regulation Learners who are *"proactive in their efforts to learn because they are aware of their strengths and limitations and because they are guided by personally set goals and task-related strategies [... involving] self-motivation, and behavioural skill [development... It] involves the selective use of specific processes that they will personally adapt to the learning task"* (Zimmerman, 2002, p. 65–66).

Single-cycle degree (SiCD) An integrated programme under the standardized EHEA framework. It combines both the first and second cycle into one 5- to 6-year degree, requiring 300-360 ECTS to complete, and usually leads to the awarding of a master degree. Sometimes referred to as integrated master's degrees. Entry requirement is usually completion of upper secondary education or equivalent (European Commission, Directorate-General for Education, Youth, Sport and Culture, 2015; European Higher Education Area, 2018).

Spatial ability Cognitive foundation and the capacity to generate, retain, and mentally manipulate visual images in two- and three-dimensional space (Buckley et al., 2018; Lohman, 1994).

STEAM Science, Technology, Engineering, Arts, and Mathematics.

STEM Science, Technology, Engineering, and Mathematics.

Subject This term can refer to a topic within a discipline, for instance the subject of mathematics, but may also refer to a self-contained, credit-giving educational unit. In the latter meaning this handbook employs the term *module*.

Sustainable Development Goals (SDGs) A set of 17 goals as a call to action for the 2030 Agenda for Sustainable Development which were adopted in 2015 by all United Nations members, highlighting the connections between the environmental, social, and economic aspects of sustainable development (United Nations, 2015).

Teamwork — Collaborative goal setting Teamwork refers to the coordinated actions of two or more individuals to achieve a common goal (Driskell et al., 2018; Xyrichis & Ream, 2008).

Teamwork — Diverse, intercultural, and inclusive teamwork The ability to *"[u]nderstand cultural differences, recognize their importance or benefit and stimulate cooperative teamwork among people of different cultures"* (Leandro Cruz & Saunders-Smiths, 2019, p. 14). It includes non-homogeneous, cross-cultural understanding and inclusive collaboration and the ability to work in teams with people of different abilities, gender, and backgrounds, and across hierarchical frameworks.

Teamwork — Engagement This term refers to a person who *"shares information and knowledge with team members and shows engagement with teamwork"* (Leandro Cruz & Saunders-Smiths, 2019, p. 14).

Teamwork — Multi-/inter-/transdisciplinary teams The ability to collaborate “*with team members of engineering disciplines and of other disciplines, including clients*” (Leandro Cruz & Saunders-Smiths, 2019, p. 17), beyond STEM and including AHSS.

Technical skills Competencies and skills ranging “*from the foundation and application of science to the applied mathematical and computational skills necessary to develop technical solutions in the sense of innovation and current demands*”(SEFI, 2025, p. 2).

Theoretical framework In the context of Engineering Education Research, a framework which interconnects ideas, concepts, and relationships of interest in the study, and helps to inform the design of the inquiry (Magana, 2021).

Theory of knowledge interest The theory that humans construct knowledge according to three fundamental interests. In this context, *interest* means a fundamental orientation of human thinking by which humans develop means and methods for promoting life. These interests are technical (control and prediction), practical (understanding through interaction), and emancipatory (reflection, autonomy, and transformation). Engineering education overwhelmingly prioritises the technical interest (Denton, 2011; Habermas, 1971, 1973).

Third-cycle degree (TCD) The third step in the higher education degree cycle under the standardized EHEA framework. This is typically a PhD-level programme, lasting 3 or 4 years. Entry requirements are typically either an FCD and/or SCD or equivalent (European Higher Education Area, 2018; European Commission, Directorate-General for Education, Youth, Sport and Culture, 2015).

Transdisciplinary competencies and skills Competencies and skills that “[a]fford an outward facing, broader appreciation and active engagement with traditional and non-traditional sources of knowledge from both academic and non-academic domains. These encompass skills related to ethical decision-making, sustainability and social responsibility”(SEFI, 2025, p. 2).

Transferable competencies and skills Competencies and skills “*that are needed to adapt to various life contexts and that people can potentially transfer to different social, cultural or work settings*” (UNICEF, 2022, p. 3).

UK-SPEC The Standard for Professional Engineering Competence and Commitment for the United Kingdom, that explains the competence and commitment requirements that engineering professionals must meet to qualify for professional titles such as Chartered Engineer (Engineering Council, 2020).

Undergraduate Learner in a first-cycle degree programme.

Visualisation skills The active, applied processes that draw on spatial ability to construct, interpret, and work with mental images in order to understand and solve engineering problems (Raju & Sorby, 2024; Sorby et al., 2013).

VUCA Volatility, Uncertainty, Complexity, and Ambiguity, indicating factors that leaders should navigate in order for their teams to function in turbulent and uncertain environments (Bennis & Nanus, 1985).

Washington Accord (WA) An agreement, started in 1989, among signatory entities responsible for accrediting tertiary-level engineering qualifications from across the globe to mutually recognize each other's accredited engineering degrees to aid global mobility (International Engineering Alliance, n.d.).

Wicked problems Challenges that are dynamic, complex, interconnected and not easily solved (Buchanan, 1992; Mazzucato, 2018).

Written communication and reporting skills *"The ability to develop a logical, accurate, detailed, and organised written product using the appropriate language and style without grammar mistakes and with accurate references"* (Leandro Cruz & Saunders-Smiths, 2019, p.17).

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AI statement

During the preparation of this work the authors did not make use of any AI tools.

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