



European Engineering Learning Innovation & Science Alliance

EISSO

WORK PACKAGE 8

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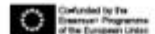
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EELISA WP8 - DISCIPLINARY BROADENING

GENERAL OBJECTIVE

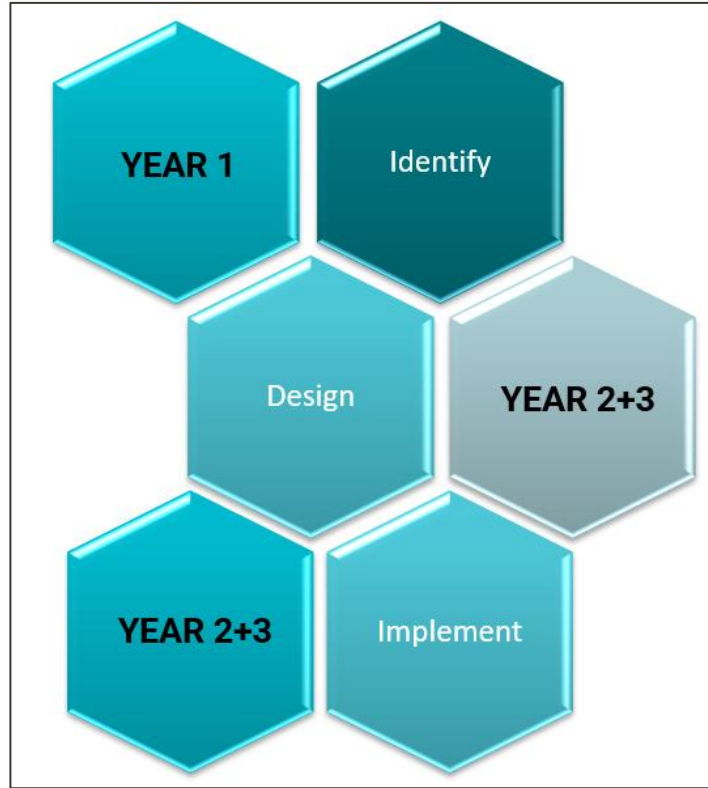
EELISA Work Package 8 on **Disciplinary broadening** aims at nurturing communities of professors, researchers, inventors and entrepreneurs that are trained to work in teams, embedded in international networks, on **complex problems and challenges** that require **interdisciplinary solutions and domains**. On the one hand, WP8 will focus on the new complementary skills needed to create new **'Renaissance' engineers**. On the other hand, WP8 will pay attention to the competences required in an increasing number of different fields, based on **multiskilling and the integration** of cognate disciplines.

WP8 will pursue a **Disciplinary broadening** aiming at involving scholars from all sectors, according to a holistic approach oriented to introduce engineering competencies in non-engineering areas, and vice-versa.

- interaction with all sectors of Social Sciences and Humanities (SH), Life Sciences (LS), and Physical Sciences and Engineering (PE).

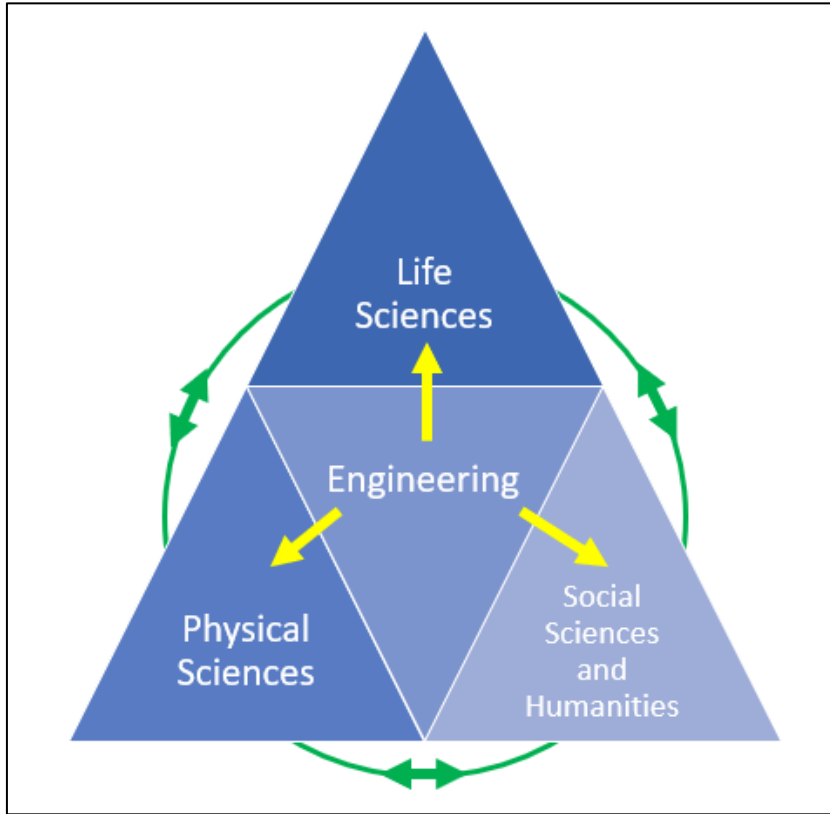


WP8 methodological framework



The WP8 methodological framework followed a three-phase approach. During the year 1 of activity, WP8 focused on the identification of interdisciplinary needs of the engineer of the future, and, conversely, the engineering skills needs of other professional domains. This result was achieved thanks to the organization of Disciplinary Broadening Workshops. During the year 2 of activity, instead, WP8 focused on the design and the implementation of Multiskilling pilots, which are expected to lead towards innovative models of multiskilling and hybridisation of engineering education, and of other disciplinary domains.

EELISA strategy towards broadening engineering education with non-engineering competences



Mutual exchanges among LS, SH, and PE domains (defined coherently with the ERC panels), with a focus on engineering competences fertilizing an increasing number of different professional and educational fields.

The strategy implemented towards broadening engineering education with non-engineering competences served to promote an exchange of Engineering (E) with a holistic approach oriented to foster a mutually beneficial interaction involving scholars from all domains, i.e., Social Sciences and Humanities (SH, using the ERC labeling), Life Sciences (LS), and Physical Sciences (P).

The method designed includes desk research, within-network interaction and mapping, and the organisation of Disciplinary Broadening Workshops with the participation of practitioner communities.

Following the approval of the EELISA Executive Board, WP8 launched a “Call for proposals” in April 2021 aimed to organize a series of Disciplinary Broadening Workshops.

EELISA DISCIPLINARY BROADENING WORKSHOPS

OPEN CALL

Workshops aim

Identify major challenges with educational implications in each academic macro-area merging bottom-up and top-down definition of topics

- For bottom-up proposals, a workshop should be proposed by at least 6 Faculty members affiliated to at least 3 universities of the EELISA alliance
- For top-down proposals, a workshop should be approved by the EELISA Executive Board



call for
disciplinary
broadening
workshops



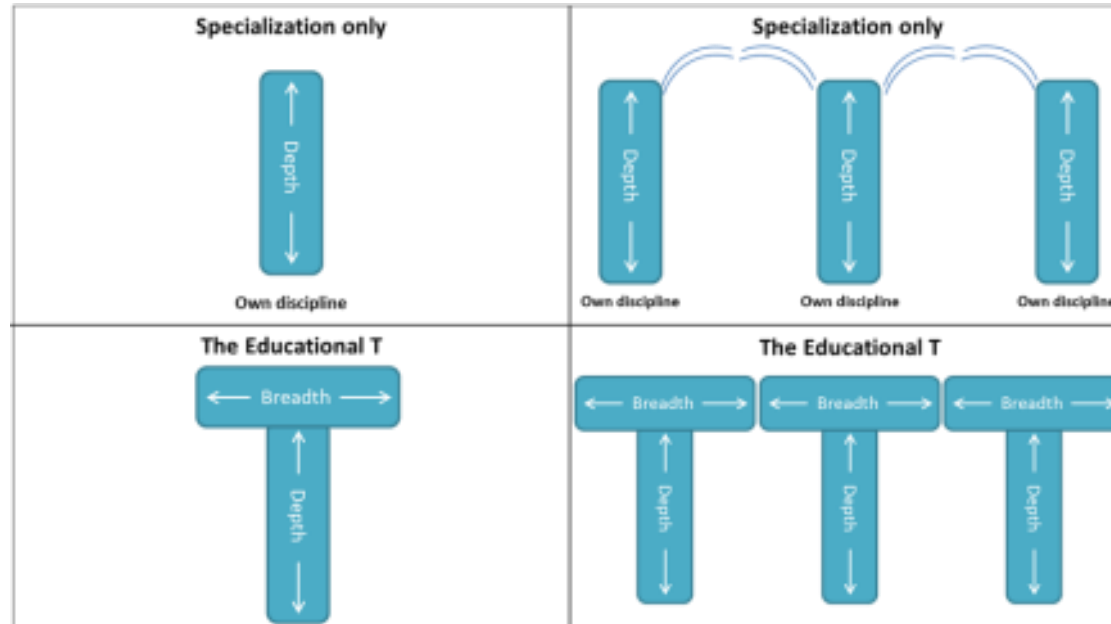
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<https://eelisa.eu/make-your-impact-call-for-disciplinary-broadening-workshops/>

Disciplinary Broadening T-model

EELISA Disciplinary Broadening Workshops contributed to identifying educational needs suitable to enrich the skill sets for the engineer of the future with non-engineering competences and, conversely, to introduce engineering competences in other academic macro-areas.

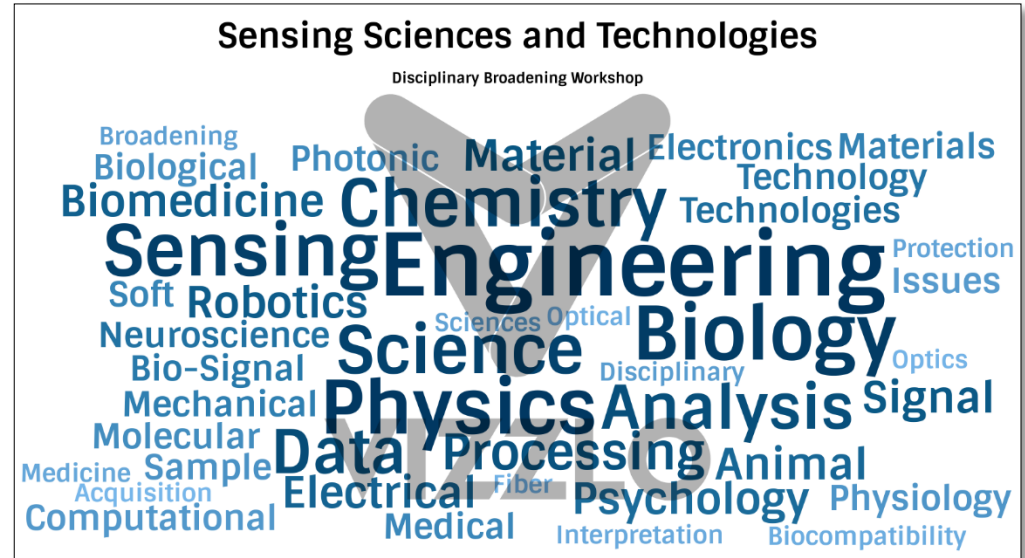
A major outcome of the EELISA Disciplinary Broadening Workshops is a consensus on the relevance of the T-shaped model to explain how engineers achieve the same background knowledge by "basic" education (horizontal axis of the T), and then they focus on vertical themes when they specialize.



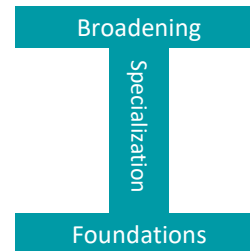
Disciplinary Broadening rotated-H-model

A word cloud representation of the keywords from the Disciplinary Broadening Workshop “Sensing Sciences and Technologies”, the “core” of engineering, i.e., such as Science, Physics, Analysis, Chemistry, Material, Data, Processing, Computational, Technologies, Mechanical, Electrical, Robotics, ..., is well represented and expressed by bigger and darker keywords. Whereas the smaller and faded words represent the specific topics of the Workshop. It underlines the importance and the pertinency of the T-model that we are adopting in WP8. Therefore, explaining that Engineers achieve the same background knowledge through “basic” education (horizontal axis of the T), and then they focus on vertical themes when they specialise.

Furthermore, it has been suggested that a rotated-H-shaped model can fit better into the EELISA vision based on three elements: foundations, specialization, and broadening. The rotated H-shaped model can introduce and ensure a solid background for sustainability transformation within engineering education.



the educational rotated-H-shaped model fits better into the EELISA vision based on three elements: foundations, specialization, and broadening.



The workshops may suggest a «rotated-H» model, to better frame the «T» model

EELISA article on Disciplinary Broadening

Encouraged by this result, the working group of EELISA WP8 submitted an abstract entitled “Disciplinary broadening as a tool for transformation towards sustainability in engineering education. The EELISA case study.” to the European Journal of Engineering Education (EJEE), which was accepted for the [Special Issue](#) on Sustainability in Engineering Education – Integration and Transformation Approaches abstracts submission deadline January 8, 2023, and full manuscripts deadline September 1, 2023).

The focus of this special issue is on how sustainability and sustainable development can be meaningfully integrated in engineering education, and how even more profound sustainability transformations can be achieved in, as well as through, engineering education.

Our paper presents the “EELISA case study” about the educational rotated-H-shaped model in terms of a main result of the Disciplinary Broadening Workshops aimed to identify the interdisciplinary needs of future engineers.

EELISA article on Disciplinary Broadening - References

[1] UN Transforming our world: the 2030 Agenda for Sustainable Development (2015)

<https://documents-dds-ny.un.org/doc/UNDOC/GEN/N15/291/89/PDF/N1529189.pdf?OpenElement> (retrieved 07/01/2023)

[2] EELISA <https://eelisa.eu> (retrieved 06/01/2023)

[3] Ninan, J., Hertogh, M. and Liu, Y. (2022) 'Educating engineers of the future: T-shaped professionals for managing infrastructure projects', Project Leadership and Society, Vol. 3, 2022, <https://doi.org/10.1016/j.plas.2022.100071>.

[4] Oskam, I. F. (2009) 'T-shaped engineers for interdisciplinary innovation: an attractive perspective for young people as well as a must for innovative organizations', 37th Annual Conference – Attract- ing students in Engineering, Rotterdam, The Netherlands, 1– 4 July 2009.

[5] Uhlenbrook, S. and de Jong, E. (2012): T-shaped competency profile for water professionals of the future, Hydrology and Earth System Sciences, 16, 3475–3483, <https://doi.org/10.5194/hess-16-3475-2012>

[6] Görgül, E., Erden, H.S. (2022) 'In the Search for the Future Engineer: The EELISA Disciplinary Broadening Workshop Experience', The European Society for Engineering Education (SEFI) 50th Annual Conference, 19-22 September 2022, Barcelona, Spain.

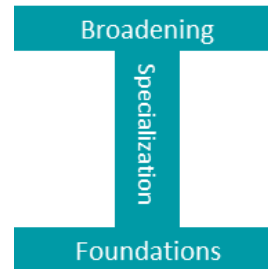
Topic 2 – Multiskilling pilots

What is a multiskilling pilot? It is a disciplinary broadening initiative (a teaching course, a learning activity, a training opportunity, etc.) suitable for hybridising engineering education with skills from other disciplines, and, vice versa, for hybridising professions that increasingly require the absorption of some knowledge from engineering.

What is the EELISA financial support for? Organization of meetings to design multiskilling pilots proposed by Faculty members from all disciplines of at least two EELISA institutions with the involvement of Faculty members of 1 additional EELISA institution.

Not-limited-to list of eligible pilots:

- Joint Degree (Bachelor, Master or PhD);
- Seasonal School;
- Blended Intensive Programme (BIP);
- ...



EELISA vision of hybridization is based on three elements:

- foundations -> same background knowledge by “basic” education;
- specialization -> focus on vertical themes;
- broadening -> enrichment with skills from other disciplines.

Topic 2 – Evaluation Criteria

Relevance (Maximum 30 points)

- Clear multiskilling pilot concept and goals (< 15 Points)
- Reference to the T/rotated-H model of Disciplinary Broadening as methodological frameworks for the design of multiskilling pilots (< 15 Points)

Quality (Maximum 30 points)

- Number of EELISA institutions involved in the organization (< 10 Points)
- Participation and role of external stakeholders (< 10 Points)
- Resource efficiency (expected impact / requested funding) (< 15 Points)

Topic 2 – Evaluation Criteria

Impact on the Alliance (Maximum 40 points)

- Inclusion of courses already registered in the EELISA catalogue OR brand-new courses complementary to existing ones based on results of analysis (< 5 Points)
- Contribution to the implementation of Joint Ph.D. programmes within EELISA (< 10 Points)
- Contribution to explore the research content of educational activities in EELISA capable to enable joint research activities engaging students, researchers, faculty members and external stakeholders (< 10 Points)
- Link with the task forces on specific topics in process of creation in EELISA (e.g., those in Biomedical engineering and Civil engineering) (< 5 Points)
- To have organized or, at least, actively contributed to one Disciplinary Broadening Workshop with remarkable prior awareness, inclusiveness, and feedback by relevant stakeholders on (< 10 Points)

Bonus (Maximum 10 points)

- Proposals applying disaster resilience, disaster management concepts, or any other relevant support to problem owners from the areas affected by the Türkiye-Syria earthquake and involving colleagues from ITÜ (< 10 Points)

thank

you

Learn more: www.eelisa.eu