POSTER PRESENTATIONS

Proceedings of the Second International Conference on Sustainable Energy Education (SEED 2026)

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SEED
sustainable energy education

PROLOGUE SEED PROCEEDINGS 2026

This volume presents peer-reviewed poster presentations from the Second International Conference on Sustainable Energy Education (SEED 2026) held in Utrecht, the Netherlands, 24-25 March 2026. The conference was hosted by the Centre of Expertise Smart Sustainable Cities at HU University of Applied Sciences Utrecht.

Since its inception, the SEED conference has established itself as an international forum for lecturers in vocational training and higher education, researchers, policymakers, and practitioners. SEED provides a platform for exchanging ideas, sharing experiences, and collectively addressing the challenges of the energy transition. Central to this mission is the preparation of well-equipped learners, students, and professionals, and the development of sufficient and future-ready labour capacity in the context of the energy transition.

The 2026 conference focused on four interrelated themes: the energy sector labour market, innovative energy education, the region as a university campus, and skills for the sustainable energy transition. Together, these themes framed discussions on how education systems, regions, and industries can collaborate to address current and future societal needs.

The conference programme combined academic rigour with practical engagement and included a dedicated student track, as well as sessions connected to the CoVE SEED project. Over the course of two days, the conference welcomed more than 200 participants from 25 countries worldwide. The programme featured 30 academic papers, 35 expert articles, and 18 poster presentations, alongside 23 workshops, several student contributions, excursions, and exhibitions showcasing innovative practices and regional initiatives.

Keynote speeches were delivered by Arash Aazami, who spoke on Trends and innovations in the field of the energy transition, and Marcel Koenis, who addressed the topic of Strategic regional collaboration in the energy transition. A panel discussion, moderated by Remko van der Lugt, brought together perspectives from education (Mark Tammer), policy (Marsha Wagner), and industry (Jop Amelsfoort) exploring the topic Aligning energy education and training with evolving energy labour market needs. The conference concluded with a reflective wrap-up by Marsha Wagner, synthesising key insights and outlining directions for future collaboration.

The SEED Conference is a platform for transnational learning and cooperation within the CoVE SEED project (Centre of Vocational Excellence - Sustainable Energy Education). CoVE SEED is funded by the European Union through Erasmus+ and the European Solidarity Corps (grant agreement No. 101056147). The CoVE SEED consortium consists of educational providers (EQF levels 2-7), working professionals, and policymakers from Spain, the Netherlands, Greece, Germany, and Finland. The project focuses on delivering high-quality, innovative education to support the energy transition. The project aims to equip learners and professionals with the skills needed to accelerate the energy transition; strengthen regional innovation through stakeholder collaboration; share and scale best practices in sustainable energy education; build an international learning community; and ultimately establish a Centre of Vocational Excellence in each participating region.

The organising committee would like to thank our supporters and sponsors, including the Province of Utrecht and Rabobank, whose contributions were essential to the success of the conference. We also warmly thank the keynote speakers, authors, programme committee members, reviewers, session chairs, presenters, supporters, and all participants for their engagement and commitment. Finally, our appreciation goes to HU University of Applied Sciences Utrecht for its support and for helping to make SEED 2026 a truly impactful event.

Martijn Rietbergen & Lenny van Onselen

TABLE OF CONTENTS

Prologue SEED Proceedings 2026 2

Experience Renewable Energies 4

Sustainable Energy Solutions At School Buildings 5

Building Your Own Virtual Wind Farm. The Role Of Digital Tools In Sustainable Energy Education 6

H2LIFE; Future (Y)our Energy 7

H2LIFE; Network Program For Teachers 8

Design Thinking & Entrepreneurship Workshop 9

Harmonising Education For Offshore Wind Technicians 11

Simulating Counterflow Heat Exchanger In Excel 12

Project Zero Waste 13

Smart AI Classrooms In Vocational Education 14

Balancing Interests 15

DEEL: Digital Engineering Exploration Lab 16

Building Inclusive Skills Ecosystems For A Just Energy Transition: Lessons From TRAJECTS 17

Make Hydrogen Work 18

Transdisciplinary Project-based Learning For Environmental Design 19

Energy Transition Game 20

Learning Communities System Integration 21

BIO4CE: Green, Digital And Circular Innovation In VET For Biotechnology & Pharmaceutical Labs 22

Copper 23

EXPERIENCE RENEWABLE ENERGIES

Exploring the Energy Transition in an Interactive Experience Lab

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The Experience Lab of the Institute for Sector Coupling in Hamm, Germany aims to aid the energy transition by raising awareness for renewable energies and encouraging students to consider a career in energy technology through innovative and interactive teaching formats.

"Human ingenuity is the ultimate renewable energy."[1]

Introduction

In Germany, the energy sector remains the largest source of greenhouse gas emissions, underscoring the need for a shift to climate-friendly and renewable technologies.[2] This transformation demands skilled workers, yet the energy and electrical engineering sector simultaneously faces the largest workforce gap among STEM fields.[3] The Experience Lab aims to address this gap by informing and inspiring students and the public about renewable energies.

Method

For this purpose technologies such as Augmented and Virtual Reality (AR/ VR) are employed to address diverse learning styles and foster situated learning processes. They may also enhance motivation through technology-related interest and gamified approaches.[4] Integrating digital content with the physical environment allows the visualization of complex processes and systems[5], for example comprehensibly rendering otherwise invisible energy flows.

First experiences

The various formats and educational tools are designed to be diverse and tailored to different target groups. They range from an electric car race mini-game (*Figure 2, left*) to initially stimulate interest to a fully immersive virtual museum in which students can move around and learn about different renewable power generation methods independently (*Figure 1*). The activities take place in the lab itself, at local schools or events for the broad public. Since the lab was launched at the beginning of 2025, more than 400 students from grades five to 13 have already been welcomed.

Figure 1. Students getting to know different renewable energy producers through a VR application

Conclusion and Outlook

- Innovative methods such as VR, AR, and gamification have been successfully used as a medium for learning applications on renewable energies, aiming to reach diverse student groups and spark their interest.
- The future goal is to expand the applications and tools, address additional topics related to renewable energies, and evaluate their impact on students.

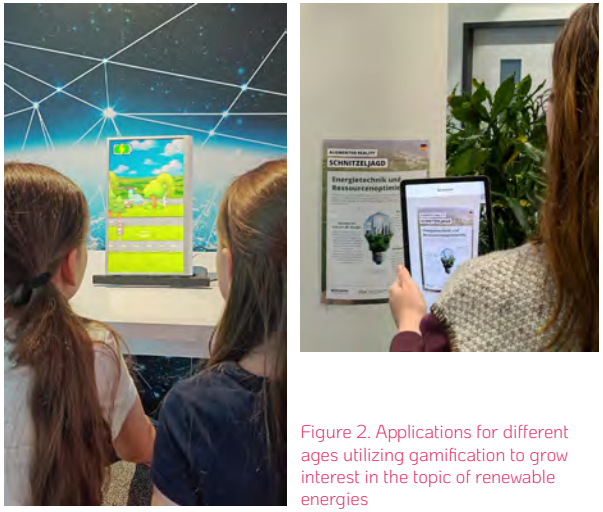

Figure 2. Applications for different ages utilizing gamification to grow interest in the topic of renewable energies

1 World Governments Summit (2025): Invest in education to harness world's ultimate renewable energy. Online verfügbar unter https://www.worldgovernmentssummit.org/media-hub/news/detail/invest-in-education-to-harness-world-s-ultimate-renewable-energy, zuletzt aktualisiert am 11.09.2025, zuletzt geprüft am 11.09.2025.

2 Bundesministerium für Wirtschaft und Klimaschutz, Klimaschutzbericht 2022: der Bundesregierung nach § 10 Absatz 1 des Bundes -Klimaschutzgesetzes. [Online]. Available: https://www.bundeswirtschaftsministerium.de/Redaktion/DE/Publikationen/Klimaschutz/klimaschutzbericht.pdf?__blob=publicationFile&v=1 (accessed: Sep. 8 2025)

3 C. Weidmann, Arbeitskräfteengpässe könnten die Umsetzung von Klimaschutz und Klimaanpassung hemmen - IAB-Forum. [Online]. Available: https://iab-forum.de/arbeitskraefteengpaesse-koennten-die-umsetzung-von-klimaschutz-und-klimaanpassung-hemmen/ (accessed: Aug. 19 2025).

4 Raphael Zender, M. Weise, Markus von der Heyde, and Heinrich Söbke, "Lehren und Lernen mit VR und AR - Was wird erwartet? Was funktioniert?(Teaching and Learning with VR and AR - What Is Expected? What Works?)," Fachtagung, 2018. [Online]. Available: https://www.semanticscholar.org/paper/Lehren-und-Lernen-mit-VR-und-AR-Was-wird-erwartet-Zender-Weise/d4750d3de8cee2c7b587df37f8ef1a890625e117

5 M. Juraschek, L. Büth, G. Posselt, and C. Herrmann, "Mixed Reality in Learning Factories," Procedia Manufacturing, vol. 23, pp. 153–158, 2018, doi: 10.1016/j.promfg.2018.04.009.

SUSTAINABLE ENERGY SOLUTIONS AT SCHOOL BUILDINGS

Joan B. Niclòs Camarasa/ Rafael Climent Martí - Conselleria d'Educació - Generalitat Valenciana

Climate change threatens our lifestyle. Are our educational centres prepared? At the beginning and end of the academic year, indoor classroom temperatures rise up to 30 ºC in Xàtiva secondary schools. Such high temperatures significantly affect the performance of both students and teachers. To mitigate these effects and create a healthier environment without sacrificing energy efficiency, a more sustainable and eco-friendly students engagement is truly required.

"Sustainable students contribution enhances classroom wellness"

Active students role method

Students are involved in a centre-based project-based learning approach through which they acquire real knowledge and practical skills in sustainability solutions that can be replicated at their homes. Learners actively take weekly responsibility for outdoor/ indoor plants care while monitor green façade performance data from indoor sensor devices in classrooms. Subsequently, students display processed data in shared areas of the school. The student role played strengthens their environmental awareness while the implemented sustainability partially mitigate the effects of climate.

Building green coating

Previous improvement experiences from EU LIFE project at CEIP Gabriela Mistral educational centre in Solana de los Barros (Badajoz) (LIFE-myBUILDINGisGREEN video) have proved that the use of natural outdoor vegetation as a building green coating can reduce indoor classroom temperatures by 5 to 7 ºC by preventing sun radiation gains.
Outdoor Plants absorb atmospheric CO_2 and naturally release oxygen and moisture providing fresher and higher-quality incoming airflow through windows. Better classroom atmosphere upgrade students learning performance.

Greener classroom environment

The presence of air-purifying indoor plants in classrooms -such as Spathiphyllum- contributes to indoor air renewal, reduces CO_2 concentration, promotes a greener and healthier environment and naturally regulates inner temperatures.
A naturalized classroom environment fosters positive student attitudes while reducing indoor peer-to-peer conflicts. Learners also develop a sense of responsibility through plant care activities which promotes mental well-being and grow green competences.

Conclusions

- Naturalizing educational spaces contributes to reducing climate hazards in classrooms by reducing the conventionalc limatization systems supply.
- School buildings become s sustainability laboratories, providing a more student-friendly environment.
- Students play a key role in the implementation of sustainable solutions fostering their engagement and the development of practical skills.
- Long-term sustainability awareness among young people can be achieved through natural-simple, cost-effective, and high-impact solutions.

Figure 1. Green coating IES Lluís Simarro Lacabra educational centre simulation.

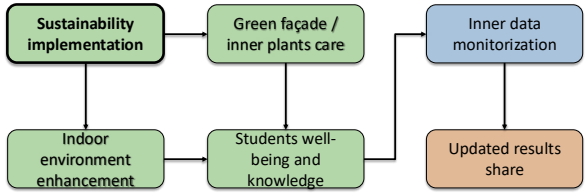

Figure 2. Keyboxes

Figure 3. Spathiphyllum indoor plant in classroom.

BUILDING YOUR OWN VIRTUAL WIND FARM. THE ROLE OF DIGITAL TOOLS IN SUSTAINABLE ENERGY EDUCATION

Marinela Istrate - Faculty of Geography and Geology, "Alexandru Ioan Cuza" University of Iasi, Romania

In higher education, digital tools play a crucial role in fostering innovation and preparing students for the jobs of the future through adaptive learning and creativity (Zhang et al., 2025). Digital tools used in energy projects are necessary because they enable students to apply theoretical knowledge to simulate real-life situations, thereby developing professional competencies and transferable skills (Negi, 2024; Jeong & González-Gómez, 2020).

Highlight of results

- Many applications offer free and open access to students interested in wind energy
- The practical information provided by Wimby contributes to the involvement of students in the processes of planning, implementing and operating wind farms

Method

WIMBY is a European-funded project supporting the adoption and acceptance of wind energy in the European Union. The project offers an interactive Web-GIS platform to enhance the accessibility and usability of information (https://wimby.eu/), also addressing challenges that may hinder the deployment of wind farms. Using this application, we created an onshore wind farm in northeastern Romania (https://wimby.stag.nazkamapps.com/). All the characteristics of this virtual farm were analyzed.

Results and Discussion

The wind farm was situated in a hilly area of the Deleni village, Iași County (Fig. 1). Students can select parameters like the location of the wind farm (onshore or offshore) and the number of turbines. An area of 1 km² was selected, where five wind turbines, each with a height of 110 m, were located. The wind speed exceeds 6m/s, which is a favorable aspect for energy capture (Fig. 2). The application provides information on the terrain's characteristics (elevation and ruggedness index) and highlights areas that present low and hard constraints (ecology, land use, infrastructure, etc.) (Fig. 3). By accessing the menu on the left side of the screen, we can find information about annual energy output (36.6 GWh), capacity factor (0.25) and cost of electricity. Regarding the impact of our virtual wind farm, it manifests itself on land use (fig. 4) and on fauna (birds and bats) (fig. 5). In total, 235 jobs (direct, indirect and induced) could be generated by the development of this wind project (fig. 6), especially in the operation and maintenance phase.

Conclusions

The information provided by the digital model is very clear

- Using the Wimby application in direct work with students, it was found that this type of tool offers an engaging way of learning that combines theory with practice.
- The ability of digital tools to educate, create technical skills and increase awareness is highly appreciated by students and professors.

1. Zhang, Y., Jagannathan, R., Dougan, L., Ganesh Pichamuthu, B. & Ndlovu, S. (2025). Universities must move with the times: How six scholars tackle AI, mental health and more. Nature, 645(8082), 852-855
2. Negi, S.K. (2024). Exploring the Impact of Virtual Reality and Augmented Reality Technologies in Sustainability Education on Green Energy and Sustainability Behavioral Change: A Qualitative Analysis. Procedia Computer Science, vol. 236, 550-557
3. Jeong, J.S. & González-Gómez, D. (2020). A web-based tool framing a collective method for optimizing the location of a renewable energy facility and its possible application to sustainable STEM education. Journal of Cleaner Production, vol. 251, 119747
4. Wimby. Wind in my backyard. https://wimby.eu/
5. Wimby. Start wind farm simulation. https://wimby.stag.nazkamapps.com/

Figure 1. Location of the virtual wind farm .

Figure 2. Wind resources in the selected area

Figure 3. Exclusion zones (hard constraints)

Figure 4. Impact on land use

Figure 5. Collision risk (birds and bats)

Life Stage	Share	Direct jobs	Indirect Jobs	Induced Jobs
Development	4%	3	3	3
Construction	19.3%	9	16	21
Manufacturing	28.1%	19	28	18
O&M	43%	34	30	38
Decommissioning	5.6%	4	5	5

Figure 6. Created jobs

H2LIFE; FUTURE (Y)OUR ENERGY

R. van Buuren[1], V. Wiegel[1], J. Geurts van Kessel[1], C. Kattenbelt[1], H. van Vlokhoven[1],B. Jimmink[2] - 1 HAN University of Applied Sciences, 2 Aventus

The H2LIFE project strengthens the Lifeport hydrogen ecosystem by increasing responsiveness of and interconnection between several layered learning communities. Future (y)our Energy is one of several domain-specific experiments within this project that have been proposed to integrate working, learning and innovating and to move towards learning with each other.

Experiment: Future (Y)our Energy

Uncertainty in the required skills, knowledge and competencies to effectively participate in issues surrounding grid congestion requires agility and adaptiveness in the focus and content of training. Learner agency is a core element. Skills-based training and education in shared ownership between government, business and knowledge institutions increases the basis on which the training rest. This reduces the time needed for the employer to train a new employee before he or she can be effectively deployed.

"Learn the skills of tomorrow through challenges"

How FYE works

Students of all levels and disciplines are jointly working on real challenges that truly matter. This skills-based initiative is based on principles of student-centered learning and impactful learning. A small number of students is currently participating in the pilot phase. During their learning path, the candidates follow training courses, do (individual) assignments and work closely with the quadruple helix partners involved. In the coming years, this skills-based approach will be expanded multi-level (MBO-HBO-PD) and participants who follow a short training will also become part of the initiative. The previous year the first multilevel studentteams have successfully tackled challenges together in close cooperation with businesses.

FYE and ecosystem responsiveness

In the H2LIFE project the following questions are examined:

- How can you facilitate and safeguard shared programming, ownership and governance in skills-based education and training between government, companies and knowledge institutions?
- What preconditions need to be created to effectively bring students of different levels (EQF levels 4 through 8), with different study pace and study durations to a joint learning and development environment?

1. K.Dikilitas et al, a practical Guide to understanding and implementing Challenge-based learning (palgrave Macmillan 2025
2. V. Wiegel, Lean in the classroom, Routledge, 2019
3. F. Dochy M. Segers, Creating impact through future learning: the high impact learning that lasts (HILL) model, Taylor and Francis, 2018

Figure 1. Examples of multilevel student teams working on challenges

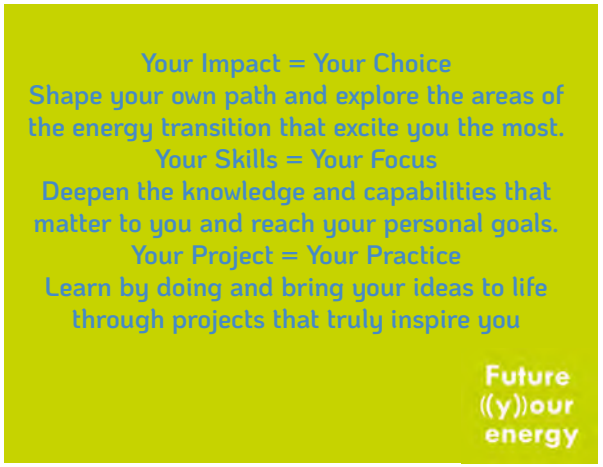

Figure 2. Future (Y)our Energy Concept

H2LIFE; NETWORK PROGRAM FOR TEACHERS

M. Willems[1],B. Jimmink[2], J. Geurts van Kessel[1], C. Kattenbelt[1]1 HAN University of Applied Sciences, 2 Aventus

The H2LIFE project strengthens the Lifeport hydrogen ecosystem by increasing responsiveness of and interconnection between several layered learning communities. The Hydrogen Network Program for Teachers creates this interconnection by bringing together the knowledge institutions on vocational and higher education level and increasing their combined responsiveness.
Experiment: Hydrogen Network Program for

Teachers

The goal of the Hydrogen Network Program for Teachers is to facilitate and foster collaboration between teachers from technical vocational and higher education programs of a large number of different knowledge institutions within the ecosystem that include (or aim to include) hydrogen as a component. The program facilitates that members learn with and from each other. It provides opportunities for teachers thereby deepening the knowledge about hydrogen of individuals and increasing the interconnectedness of the ecosystem.

"Alone you may go faster, but together we go further"

How NPfT works

The Networking Program for Teachers organizes 5 days in which teachers from different knowledge institutes meet and exchange information with each other. Part of the program of these sessions is:

- **Getting Acquainted, Gaining knowledge** through interaction with research experts and company representatives
- **Exploring and visiting relevant locations** to get a better insight into the regional ecosystem
- **Exchanging and Sharing developed learning and working materials** to further professionalize individual vocational and higher education institutions.
- **Exercise with practical learning tools and lab equipment**

NPfT and ecosystem responsiveness

In the H2LIFE project the following questions are examined:

- What strategies (on role development, interactions with stakeholders and collaboration in authentic learning environments) can educators in authentic learning environment deploy to create responsive educational programs that enhance responsiveness of future employees?
- What conditions and support structures should responsive educational programs create/put in place to ensure that the knowledge developed in ecosystems flows back in regular work processes.

Figure 1. Pictures of program

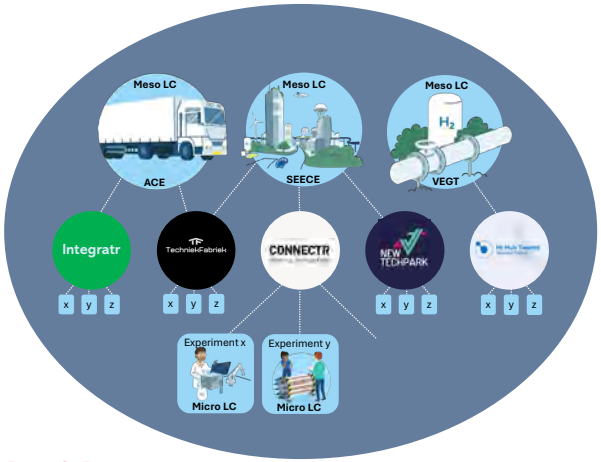

Figure 2. Existing ecosystem

DESIGN THINKING & ENTREPRENEURSHIP WORKSHOP

Markku Kynsijärvi - Raseko

An innovative, human-centered approach to addressing contemporary educational challenges, Design Thinking was used as a pedagogical framework to support collaborative problem-solving in learning and teaching contexts. The workshop brought together a multicultural and international group of students from Germany, Finland, Taiwan, Vietnam, and Spain, fostering diverse perspectives and cross-cultural collaboration.
While aligned with broader sustainability-oriented thinking (e.g. long-term impact and responsible innovation), the workshop primarily focused on educational innovation by supporting the development of key student competences such as critical thinking, empathy, systems awareness, and iterative problem-solving. By engaging learners in real-world challenges and reflective practice, the workshop demonstrates how education can equip students with transferable capabilities needed to design more sustainable and responsible solutions in their future professional and societal roles.

"Empowering innovation through human-centered design"

Method

The workshops combine **Design Thinking** and an **Entrepreneurial Mindset** to guide participants in creating innovative, user-centered solutions to educational challenges. Working in interdisciplinary teams, participants move through the stages of empathize, define, ideate, prototype, and test, using interviews, observations, and structured problem-framing tools to understand real user needs in learning environments.

Conceptually, the workshop draws on principles of experiential and problem-based learning, positioning students as active co-creators of knowledge rather than passive recipients. The integration of the entrepreneurial mindset supports the development of competences such as opportunity recognition, creative confidence, and iterative learning; skills increasingly recognized as essential in higher education.
Throughout the process, participants apply entrepreneurial tools including opportunity assessment, rapid prototyping, and value proposition development to test assumptions and refine ideas. Observations and participant reflections indicate improved collaboration, increased sensitivity to learner needs, and greater confidence in applying human-centered problem-solving approaches to educational contexts.
The workshop has been conducted over two consecutive years and continues on an annual basis, addressing different educational challenges each time. This iterative implementation demonstrates the adaptability of the method across diverse learning contexts and cohorts.

Topic 1

Educational Challenge
In an educational context focused on biodiversity learning and citizen science, students explored how digital tools can support informal environmental education. Nature enthusiasts and community members lacked an intuitive way to identify butterflies and report local sightings, making it difficult to learn about biodiversity and monitor habitats.
Key Insights
User research showed that learners want quick, intuitive identification support and are motivated by nature protection, but are unsure how to contribute. These findings emphasized that educational tools must minimize technical barriers to support meaningful participation and learning.
Testing & Learning Outcomes
Peer testing revealed the need for clearer guidance and a more streamlined reporting flow. For students, this iteration demonstrated how design decisions directly influence learner engagement and know-ledge-building in environmental education.
Reflection
Initial prototypes assumed that motivation alone would drive participation. Testing revealed that even highly motivated learners disengage when interfaces are unclear or effort-intensive. This insight helped students understand how usability directly influences learning, participation, and knowledge construction in environmental education.

Topic 2

Educational Challenge
As part of a learning scenario in robotics and workplace safety education, students addressed the challenge of human-robot co-operation in shared workspaces, where unclear interaction zones increase risk.
Key Insights
Learner research and testing revealed that predictable robot behavior and clearly defined safety boundaries are essential not only for safe operation, but also for supporting understanding and trust in human–machine interaction.
Prototype, Testing & Learning Outcomes
Through building and testing sensor-based prototypes, students encountered limitations in accuracy and response time. These constraints

functioned as learning triggers, helping students develop systems thinking, safety awareness, and collaborative problem-solving skills relevant to robotics education.

Reflection

While rapid prototyping supported hands-on learning, discussions with peers and visitors highlighted a key limitation: in safety-critical contexts, such as human-robot collaboration, stakeholders are unlikely to trust experimental prototypes. Industry standards and regulatory requirements mean that reliable, certified monitoring equipment is often necessary to ensure user safety. This tension helped students recognize the gap between exploratory learning prototypes and deployable industrial solutions, reinforcing the importance of standards, validation, and system reliability in robotics education.

Conclusions

Butterfly Apps

A clearly defined user challenge in education led to a simple prototype for reporting butterfly sightings. Peer testing revealed usability issues, particularly unclear instructions and friction in the reporting flow. These shortcomings highlighted how initial assumptions about user behavior often differ from real learner needs, underlining the value of iterative testing in the design of educational tools.

Human-Robot Co-operation

Sensor-based prototypes explored tracking worker positions and defining safe zones. Testing exposed technical and conceptual limitations, including the complexity of translating abstract safety requirements into functional prototypes. These challenges demonstrated how hands-on experimentation supports learning in robotics and safety, while also revealing the need for adequate scaffolding when students work with complex technologies.

Design Thinking Outcomes

Across teams, the iterative process of empathize, define, prototype and test enabled participants to surface real user needs while confronting the constraints of time, technical feasibility, and prior knowledge. Rather than producing polished solutions, the workshop fostered experiential learning by encouraging reflection, adaptation, and learning through failure. These outcomes suggest that

Design Thinking is particularly valuable in educational contexts where the learning process itself is as important as the final solution.

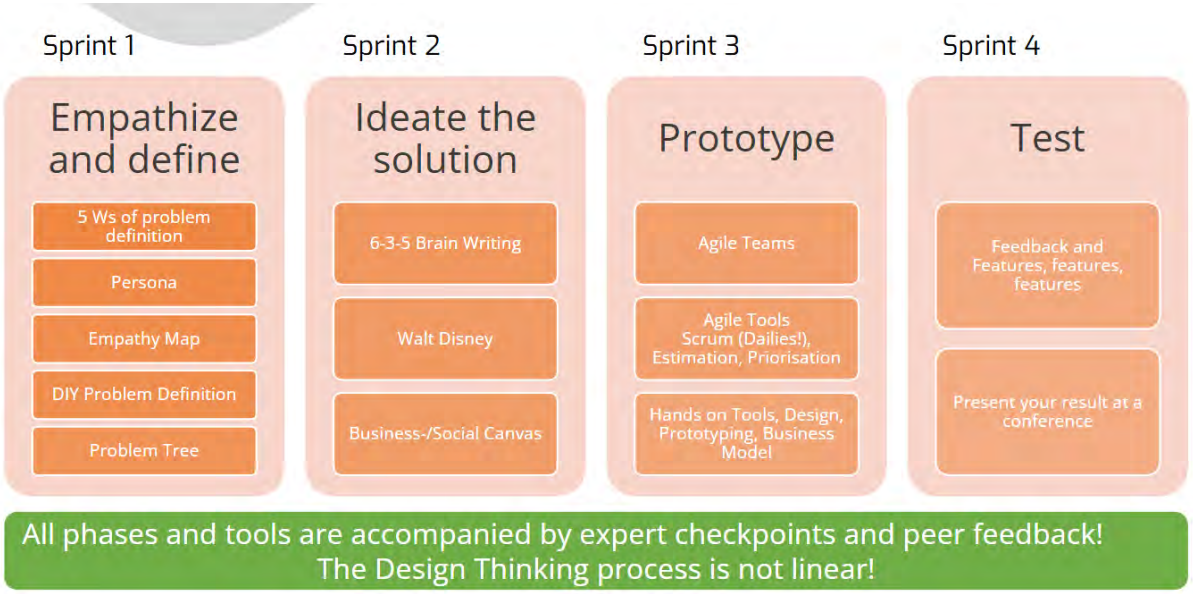

Figure 1. Mapping tools to phases

Figure 2. Prototyping

1. https://www.designentrepreneurshipworkshop.org/2025/09/23/dtew-2025-hamburg-group-4/
2. https://www.raseko.fi/design-thinking-workshop/

HARMONISING EDUCATION FOR OFFSHORE WIND TECHNICIANS

Dáire Horgan - T-shore education partners | WP3, WP4

Europe's offshore wind sector is growing fast, but technician education remains fragmented across borders. T-shore Education, part of the Erasmus+ Centres of Vocational Excellence (CoVE) initiative, connects educators, industry, and policymakers across five countries to co-create a shared, industry-aligned training framework for offshore wind technicians. Through harmonised modules and common competencies, T-shore helps Europe develop a skilled, mobile, and future-ready workforce.

"Education and industry collaboration are shaping Europe's offshore wind workforce."

Approach

- Collaboration between vocational schools and industry partners to co-design a common training pathway.
- Competency mapping to define essential offshore wind technician skills.
- Development of 10 harmonised training modules covering technical, safety, and communication skills.
- Train-the-Trainer exchanges to share teaching methods and infrastructure.
- Regional implementation through Centres of Vocational Excellence (CoVEs).

Key insights

- A shared European competency framework now underpins technician training.
- Harmonised learning outcomes support mutual recognition across borders.
- Collaboration strengthens links between educators and employers, improving alignment with industry needs.
- The framework is already being implemented across partner regions:
  - In Norway, it forms the basis of a new 6-week Offshore Wind Technician training programme.
  - In Denmark, a new 4-year electrical wind-focused education began through T-shore learnings.
  - In the Netherlands, Belgium and Ireland VET colleges are testing and integrating the modules into their courses.

Conclusions

T-shore's harmonised learning scenario modules for entry level wind technicians

Module / Competency	Offshore Renewable Industry	Basic Electrical Skills	Teamwork & Comms	Yaw Motor	Bolt Tightening	Gearbox Maintenance	Sensor Technology	Hydraulic Brake Systems	Hydraulic Pitch Control	Power-to-X	Total (1) ECTS
Electrical skills		+5		+3			+2				10
Mechanical skills					+2	+3					1
Hydraulic skills								+3	+2		1
HSE skills											[illegible]
Teamwork & Comms			+3								1
Familiarisation ORE	+2									+3	1

Supporting module

- T-shore shows that harmonisation in vocational education is achievable through collaboration.
- The Centres of Vocational Excellence (CoVEs) connect education, industry, and policymakers to align training with workforce needs, foster innovation in teaching, and support the continuous development of skills across regions.
- By linking these CoVEs into a European network, T-shore ensures that cooperation, quality, and innovation continue beyond the project, building a lasting foundation for Europe's offshore wind workforce.

SIMULATING COUNTERFLOW HEAT EXCHANGER IN EXCEL

Joost Jongen and Bram Smit - HU University of Applied Sciences

Counterflow Heat Exchangers are indispensable in industry. Student knowledge on this topic is highly appreciated. Two lecturers from HU Mechanical Engineering department (University of Applied Sciences Utrecht) have developed a method that allows students to simulate a heat exchanger using MS Excel.

Case

The course "Heat and Energy" has always combined a solid foundation in thermodynamics with a practical experiment. Following a curriculum revision, a need arose for a third component: simulation. The chosen method involves solving a circular reference rather than solving a differential equation. The simulation divides the counterflow heat exchanger into segments, calculating heat transfer iteratively. Each segment exchanges thermal power based on system properties such as thermal conductance, surface area, flow rates, and heat capacities.

100	72	44	30	0	0	0
17	11	0	0	0	0	0
100	72	52	30	20	0	0
26	11	7	0	0	0	0
100	75	52	37	20	13	0
26	19	7	5	0	0	0
100	75	56	37	26	13	9
33	19	13	5	3	0	0
100	78	56	42	26	19	9
33	24	13	9	3	2	0

"Quick results with an easy tool on a challenging topic"

Results

Temperature changes depend on the local temperature difference and previous segment values, requiring iterative computation. An Excel model visualizes dynamic temperature profiles for both media as they flow in opposite directions. The model uses boundary conditions and segment-based calculations to approximate real behavior. The K-value ratio influences the curve shape, ensuring accurate representation of efficiency and temperature distribution along the exchanger[1].

1 Smit, B., Jongen, J. (2025). Tutorial Simulatie TSA model Warmte en Energie.

$$\left(K_i = \frac{UA}{\dot{m}_i c_i}\right) \text{ and } \Delta t_i = K_i \Delta T_i$$

$$K_{he} = \sum_{k=0}^{n} K_i$$

Conclusions

- Excel is also a powerful tool in engineering. The ability to copy formulas across cells makes it easy to create highly accurate simulations.
- New possibilities in MS Excel are found out by students. As they explore these features, they are encouraged to approach problems in new ways.
- Students love to explore in Excel and, by doing so, they improve their digital and creative skills.

A new way of examination is used: speed assessments. More focus on the professional product, less on paper reporting for increased student happiness.

Figure 1. Heat distribution and formulas Heat Exchanger in Excel

PROJECT ZERO WASTE

Antonio Soler, Noelia Checa and Vicenta Noguera - CIPFP Canastell

The Zero Waste project, implemented at a vocational training centre, fosters an innovative and inclusive learning initiative (4, 6, 7) that unites all vocational areas and levels of education, from basic qualification programmes to higher vocational training, promoting both social and ecological sustainability (2). It also encourages digital transformation and climate action, turning vocational education into a genuine model of sustainability and educational innovation.

"Learning today to sustain tomorrow"

Concept

The *Zero Waste* project uses an interdisciplinary approach (7, 8) based on Project-Based Learning (PBL), Challenge-Based Learning (CBL), in which the distinct vocational education programmes at the higher education institution collaborate in a sustainability project that promotes inclusion and accessibility.

This approach fosters social responsibility, technical skills and environmental awareness, strengthening an innovative and sustainable educational model aligned with the Sustainable Development Goals (SDGs).

Tasks

- Separation of the organic waste generated - undertaken by the hospitality and tourism vocational education stream (1, 3).
- Installation of vermicomposting and intelligent composting systems with temperature, humidity and pH sensors, including parameter control to ensure an optimal and safe composting process.
- Automation of irrigation in the different institutional gardens through rainwater harvesting and digital humidity control.
- Reuse of materials to create vertical and accessible gardens.

Objectives

- To prevent waste and optimise resources through sustainable practices and environmental awareness (1).
- To develop intelligent composting and automated irrigation systems using monitoring technologies (4).
- To foster collaboration and student leadership across all vocational programmes (5).
- To promote sustainability through inclusion, innovation and collective well-being (7,8).

Conclusions

Although organic waste generated varies from month to month, the Zero Waste project models how sustainability, inclusivity and vocational education (5, 7) can be effectively combined.
The circular economy is driven by the active collaboration of students from diverse educational programs, transforming waste into resources and strengthening responsibility and teamwork.

Figure 1. Students collecting compost samples for analysis in the laboratory.

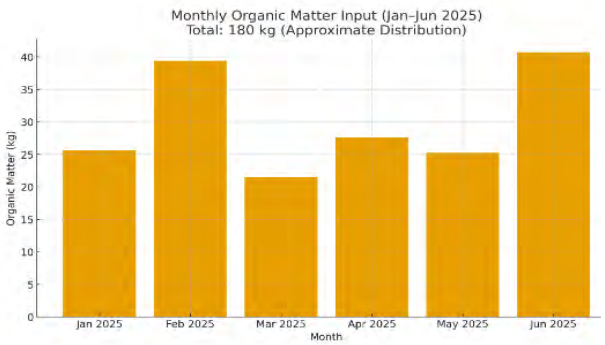

Figure 2. Pie chart showing the amount of organic matter collected on different dates

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SMART AI CLASSROOMS IN VOCATIONAL EDUCATION

Bart van Kuik & Jan Lauwerijssen - ROC Midden Nederland

Together we are ROC Midden Nederland: the (digital) makers of society. For students, staff, and partner companies, digitalization makes a vital contribution to participation in a rapidly changing society and labor market. Educational institutions such as ROC Midden Nederland encourage the development of critically minded, digitally skilled makers of society. However, digitalization is never a goal in itself - it is a means to strengthen both education and professional practice. Teachers learn together in our AI-LAB.

"Together we learn about AI, with AI and supported by AI"

Practise based research & innovation

AI is developing at lightning speed, raising questions about how it can enrich the learning process. That is why ROC Midden Nederland established an AI Lab (= professional learning community, see fig. 2 and 3), where teachers explore the added value of AI in education and professional practice including Energy Education. This goes beyond technical possibilities—it also includes the skills needed to engage with AI critically and responsibly. Both students and teachers are developing new skills, such as building chatbots and critically assessing information (ref.4,5,6,7)

All teachers, including energy education related, in vocational education are expected to enrich their didactic approaches with digital tools and to continue their professional development (ref 1, 2). This requires an open and inquisitive mindset: a willingness to experiment with new technologies also in energy transition education, reflect on their use, and pay attention to digital safety and ethics. In doing so, they can guide students toward responsible, skilled, and future-oriented use of digital tools. In this AI Lab teachers make their own Chatbots (ref. 3) in Co pilot with promting method PREPARE (fig. 4) and Blooms' inverted taxonomy (fig. 5).

Ambitions regarding to the project

Working on a **shared subtheme** around AI in education, also energy education:

- We want to jointly explore how we can apply AI responsibly and appropriately in education.
- We want to expand our knowledge and skills and actively learn from each other.
- Together, we want to apply AI tools (chatbots) in our work and in (appropriate) education.
- We also want to guide colleagues in using AI and support them with practical and ethical guidelines for AI use within ROCMN.

Figure 1. Teachers preparing AI Bots

Figure 2. Research question AI lab

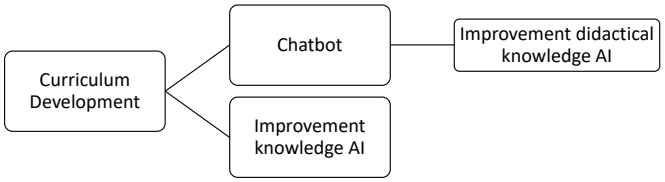

Figure 3. Determining our focus AI

Figure 4. PREPARE-framework, a useful promting method. D. Fitzpatrick AI-classroom

Fig. 5 Inverted Bloom's taxonomy for the age of AI – Michelle Kassorla (2025)

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BALANCING INTERESTS

Femke Bijker & Evert-Jan Velzing - Research group Urban Innovation, Windesheim University of Applied Sciences

What enables policy makers at municipalities to positively engage homeowners in the sustainable renovation of their homes?

"Energy transition is a social process and relates to many policy areas"

Quote by policy maker large city

Appreciative approach

Energy poverty and liveability of neighbourhoods are major socio-economic challenges. They pose a complex task for policy officers working in urban neigbourhoods. There is a need for better understanding of the profession of policy makers and their relation to homeowners.

Deskresearch + explorative qualitative interview study: Semi-structured interviews with 6-8 policy makers involved in energy transition in urban environments; deductive and inductive analysis.

Theoretical perspectives: Innovations and sustainable transition processes on societal and municipal level; democratic and normative professionalism at policy maker level.

Overarching research project: Development and innovation project *Future-proof Renovation with Integrated Quality Assurance* aims to make the future-proof renovation of homeowners' houses affordable at scale.

Duration: April 2025- onward.

Context: Pre-1990 neighbourhoods in Dutch 'new towns' like Almere and Lelystad. In Almere, for example, 33 percent of the housing stock was built before 1990.

First insights deskresearch & interview study

A comprehensive approach from different policy areas is needed: Combine tasks, fine-tuning planning and be more cost efficient

Collaboration between professionals: Aligning various interests: E.g. deepening language and interests, and ways of working

Dealing with complexity: National policy and different grant conditions are subject to change

Trustworthiness towards homeowners: E.g.clarity on costs is crucial

Way forward in the overarching research project

- Deepening everyone's working method in the process: Intention that guides action in practice
- Deep reflection with all professionals in a renovation project, aimed at learning to cope better with the complexity of reality
- Design a participatory research approach, especially with homeowners

Questions concerning professional development and learning of policy makers

- How can policy makers be trustworthy towards homeowners? - based on experiences of homeowners
- What aspects can policy makers consider in advance for better communication with homeowners?
- How do policy makers get a hold on potential advantages and disadvantages of choices for the homeowner?
- In what ways do beliefs and values play a role in the profession of policy makers?

Picture 1. Collaborating professionals in the project get to know the neighbourhood

Picture 2. One of the other neighbourhoods concerned, houses renovated with various materials

DEEL: DIGITAL ENGINEERING EXPLORATION LAB

Robert van Breukelen, Diede Wiegerinck and Steven Haveman - HU University of Applied Sciences

How do we prepare engineers for a digital and sustainable future? Through DEEL, students will be able to work with Digital Twins; linked physical and digital models to explore realistic system transitions. This helps them grow into digital system thinkers who develop innovative solutions for societal challenges

Project goal

DEEL (Dutch for "sharing") strengthens multidisciplinary and digital education with as starting point the Institute for Design & Engineering (IDE) at HU. Students learn to understand, design, and evaluate complex systems using Digital Twins. By collaborating across disciplinary boundaries, students develop into digital system thinkers who can contribute to transitions.
The approach builds on insights into hybrid learning environments, where physical and digital components reinforce each other (Alsaleh et al., 2022; Liljaniemi & Paavilainen, 2020). DEEL also responds to the growing need for systems thinking in higher education (Oosthuizen & Manzini, 2022; Jutten, 2015).
DEEL ultimately aims to realize future-proof education aligned with the evolving needs of the professional field.

"DEEL is where disciplines meet, and systems evolve."

Approach

DEEL designs and tests new educational formats using Digital Twins in multidisciplinary student teams. Pilots are conducted within the Quest program and the new EDO bachelor. The didactic framework is based on Backwards Design (McTighe & Wiggins, 1998) and is evaluated iteratively. Collaboration with research groups, the Digital Twins Lab, and external partners ensures quality. Outcomes are shared through workshops, publications, and learning communities within and beyond HU.

Expected Outcomes

- Development of at least two educational formats using multidisciplinary Digital Twins
- Execution of four pilots with evaluations by students and stakeholders
- Didactic framework for educating digital system thinkers
- Practical guide and templates for educators and curriculum developers
- Strengthening of future-oriented, interdisciplinary education across IDE programs

Figure 1. Vision of students working with DEEL

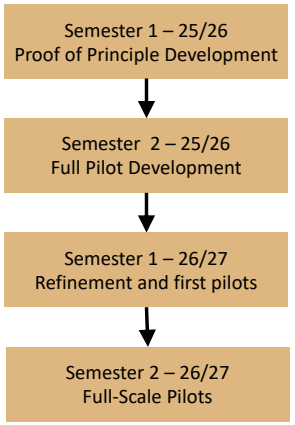

Figure 2. Timeline DEEL

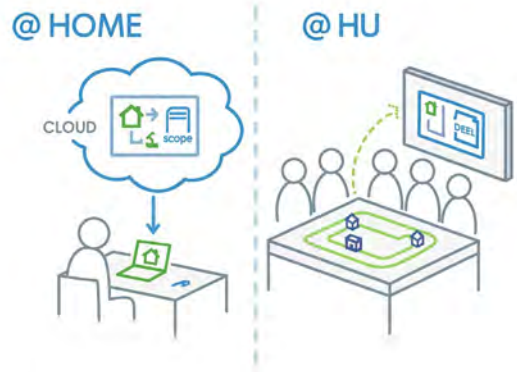

Figure 3. High-Level Approach for DEEL

The DEEL project is funded through a Senior Fellow Scholarship in the Comenius Programme by NRO.

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McTighe, J., & Wiggins, G. (1998). *Understanding by design*. ASCD.
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BUILDING INCLUSIVE SKILLS ECOSYSTEMS FOR A JUST ENERGY TRANSITION: LESSONS FROM TRAJECTS

Grace Quiceno Soto - Fossil Exit Research Group, Technische Universität Berlin

The transition to sustainable energy systems is not only a technological shift but also a social transformation that demands new ways of learning, collaborating, and governing change. Drawing on insights from TRAJECTS (2021–2025), a tri-continental capacity-building network (Germany, Colombia, South Africa), this poster explores how inclusive skills ecosystems can bridge education, research, and practice to foster equity and agency in driving the energy transition.

Case

Grounded in skills-ecosystem thinking (1, 2), this contribution draws on TRAJECTS (2021–2025) as a comparative case to examine how skills development networks foster inclusive environments for learning and collaboration. Through reflection across, formal and non-formal education, exchanges, and dialogues, it identifies enabling conditions that bridge education, research, and practice, advancing equity-oriented skills for a just energy transition across Germany, Colombia, and South Africa.

"Skills development for a just energy transition requires not only training individuals but weaving networks that link learning, policy, and practice"

Results

Skills development across contexts: PhD and master's fellowships, certified professionals, and over 100 South–South–North exchanges strengthened skills across technical, social, and governance domains.

- **Co-creation and local integration**: Mobile schools in Colombia and South Africa enabled dialogue between academic and community knowledge, fostering situated learning.
- **Ecosystemic connections**: TRAJECTS showed that linking education, research, and practice enhances collective learning, though policy engagement remains limited.
- **Cross-regional collaboration**: South–South exchange proved vital for contextual learning but faced linguistic and institutional barriers.

Conclusions

Developing skills for a just energy transition requires systemic, multi-actor learning rather than isolated training. The case shows how transnational collaboration can redistribute knowledge and agency, yet also exposes persistent asymmetries in participation. Future work should strengthen policy engagement through co-designed briefs, policy debates, and stronger governance of knowledge, aligning with international frameworks on skills for sustainable transitions (e.g., ILO, IEA, OECD). More initiatives like TRAJECTS are needed to connect regions, bridge knowledge divides, and foster mutual learning across contexts.

Figure 1. Typologies, learning spaces, and regional cooperation illustrating how cross-regional capacity building contributes to inclusive skills ecosystems.

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2. Ramsarup, P., McGrath, S. & Lotz-Sisitka, H. (2023) Reframing skills ecosystems for sustainable and just futures. International Journal of Educational Development, 101, p.102836. https://doi.org/10.1016/j.ijedudev.2023.102836.

MAKE HYDROGEN WORK

Tim van der Voord, Jan Cromwijk, Martijn Bos, Lilian Smits, Siert Akel, John Herfkens, Michiel de Vos - GroenvermogenNL

The Make Hydrogen Work initiative by GroenvermogenNL focuses on training professionals for the hydrogen economy through seven regional campuses and collaborations between businesses, education, and government. These campuses offer flexible learning pathways with microcredentials, mentoring, and modular training programs. GroenvermogenNL ensures national coordination and promotes international cooperation for knowledge exchange.

"Accelerating the green hydrogen transition by shortening the time-to-job"

A national network

- 38.000 people needed in the energy sector labour market in the Netherlands by 2030.
- Seven regional campuses each with an own roadmap tailored to their regional needs.
- €50 M invested in 2025–2030 for human capital and innovative education programs via the Dutch Nationaal Groeifonds.

Demand and skills driven

- Make Hydrogen Work employs a demand and skills-driven approach to connect educational modules with the specific needs of individuals and companies in the green hydrogen sector.
- This methodology focuses on skills-gap analyses to tailor development pathways, ensuring a swift transition to roles in the green hydrogen economy.

Involved

- GroenvermogenNL is the programme for green hydrogen capacity in the Dutch economy and society. It enables the Netherlands to build new industry and an appealing business climate.
- Seven regions where educators, employers and field labs collaborate, with sectoral associations, to align curricula and training with labour market needs.
- These campuses organize L&D networks, teacher trainings, learning materials, innovation projects, research, and ensure national knowledge exchange.

Strengthen and improve

- Make Hydrogen Work is built on proven processes and existing programmes.
- Make Hydrogen Work focuses on leveraging and strengthening existing regional networks, processes, and resources.
- L&D networks are essential to accelerate training in a demand- and skills-driven approach.
- Make Hydrogen Work will be continuously refined based on regional use cases.

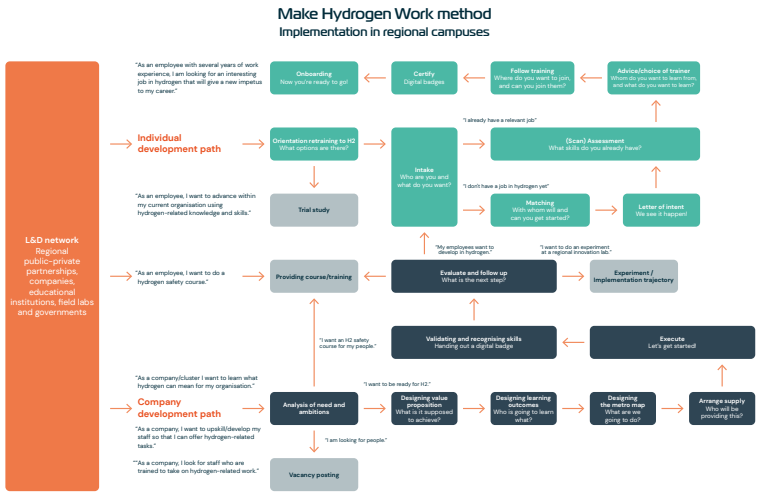

Figure 1. Individual and Company development paths

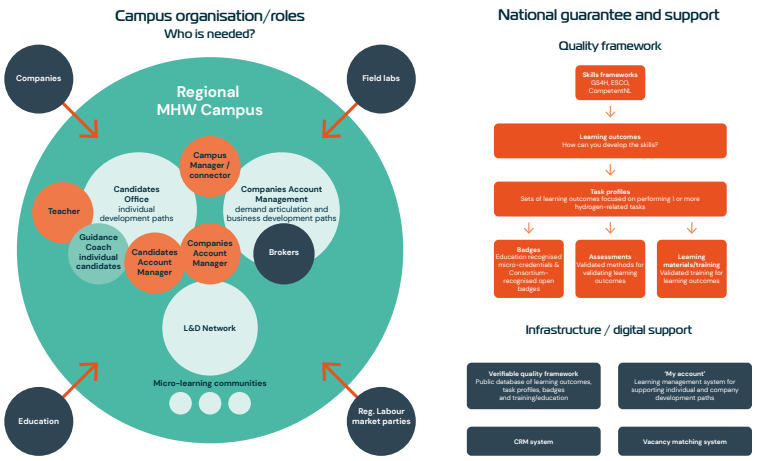

Figure 2. The organisation and tooling of Make Hydrogen Work

TRANSDISCIPLINARY PROJECT-BASED LEARNING FOR ENVIRONMENTAL DESIGN

Indu R S, Abhilash Suryan, Manju G Nair, Deepa Rani R and Jisha V R - College of Engineering Trivandrum

Design of a sustainable, energy-positive building model for community living can be mapped to many sustainable development goals. A trans-disciplinary project-based learning approach for post-graduate students and mentors from different disciplines through regular interaction with stakeholders, including the targeted community, local self-government institutions, and executing agencies, is proposed in the study.

"Responsible Architecture, Transdisciplinary Foundation, Sustainable Social Transformation"

Objectives

- To integrate sustainable development goals (1, 2, 3, 4, 6, 7, 8, 11, 12, 13, 14, 15, 17) into a case study on a transdisciplinary project-based learning approach for the design of a semi-self-sufficient habitat for community living [1, 2]
- To involve the Post Graduate students and mentors from the different contributing disciplines – Environmental design, housing, renewable energy and electrical engineering, right from the commencement of the design process, along with the stakeholders – end user communities, local self-government, executing agencies, and to evolve a socially responsive and thermally comfortable living environment in mass housing projects [3, 4, 5]

Other Design Considerations

- Renewable energy systems shall be integrated at the inception itself after assessing the potential for solar and wind energy generation at the site.
- Energy-efficient electrical equipment, water conservation, waste management, bio-gas-based systems, and smart automation shall be installed[6]

Expected Outcomes

The students, while designing, will learn:

- to integrate the SDGs in design.
- to communicate with peers from other disciplines.
- to integrate clean energy systems, thermal, and social comfort in low-income mass housing designs.
- to balance the stakeholder interests and to promote inclusivityUnited Nations (2015). "The 17 Goals". Sustainable Development Goals. Retrieved 10 September 2025. https://sdgs.un.org/goals.

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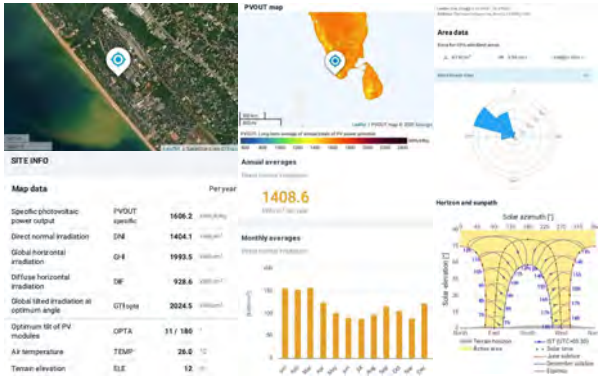

Figure 1. Solar PV out and wind power rose data obtained from Global Solar Atlas & Global Wind Atlas for a sample site 8.503994° N, 76.89506°E

Figure 2. Sketch of a proposed conceptual mass housing project for the fisherfolk of Kerala at a sample site located at 8.503994° N, 76.89506°E

Methodology

Problem framing

- Site & Context
- Stakeholder identification
- Design briefing

→

Transdisciplinary Design Development

- Team formation: Interdisciplinary post-graduate students & mentors, and stakeholders
- Field study, weather data, and stakeholder questionnaire surveys
- Iterative Design, weekly internal review, and monthly review with stakeholder feedback, final designs

→

Presentation & Analysis

- Final review
- Students reflection & Post design discussion
- Consolidated design policy proposal

ENERGY TRANSITION GAME

ir. J.M. Grift, dr. ir. B.W. de Raad, ir. C.C. van Dijk - The French Fry Factory - University of Applied Sciences Rotterdam

In 2024, Rotterdam University of Applied Sciences - Department of Mechanical Engineering - introduced an innovative introductory course on energy transition for second-year students: The Energy Transition Game. This initiative was designed to inspire interest in the energy-focused educational track and foster student engagement with sustainability challenges. This poster presents the design strategy and implementation process behind the course.

"Attractive program to recruit more students for the energy sector"

Method

Subject: Energy transition of a French fry factory.
Method: Introduction, 2 guest lectures, 1 site excursion, 2 lessons, 3 practices, guided project execution. **Practices in the energy transition laboratory:** heat pumps, hydrogen and heat transfer.
Course material: PowerPoint presentations, video clips, forms to fill out, practical manuals, technical economical model in Excel, report templates.
Completion: Poster presentation, announcement of winners.

Approach

After completing the excursions, lectures, and experimental modules, students progressed to the system design phase. Their proposed solutions were incorporated into a preconfigured simulation model to assess both technical feasibility and economic viability. Implementation timelines were strategically developed to ensure the factory's financial continuity throughout the transition process. Solutions such as wind, solar, heat pumps, vapor recompression, heat and electricity storage, hydrogen and heat recovery are used.

Assesments

Student assessment was based on partial deliverables throughout the course. Assignments, instructional materials, and interim results were communicated via Brightspace. Final designs and outcomes were showcased during a poster session, supported by oral presentations. The team that proposed a fully sustainable solution by 2050—while demonstrating the highest profitability—received the honorary award. Approximately 80 students take the training every year. Study load 84 hours over 15 weeks.

Conclusions

- The excursion and company presentations clearly illustrate the public interest
- Students gain a clear understanding of their prospective professional roles
- Students respond enthusiastically to the blended learning approach
- While the competitive element increases the course's attractiveness, it may not suit every student
- Designing a high-quality course requires significant time and effort from the teaching staff

Figure 1. Excursion to a fry factory

Figure 2. The results in terms of annual profit of the participating groups

LEARNING COMMUNITIES SYSTEM INTEGRATION

Sjoerd de Vries, Caroline van der Kooi, Patricia Bogaard, Pieter van Schaik - Hanze, Hogeschool van Amsterdam, HAN University of Applied Sciences, Delft University of Technology

This project brings together stakeholders across multiple regions to develop and evaluate Learning Communities (LCs) aimed at enhancing knowledge and collaboration for system integration (SI) challenges within the energy transition in the Netherlands.

"A structured process for knowledge transfer is important"

Approach

In the energy transition a lot of knowledge and expertise must be developed in a collaboration of both businesses and educational institutions.
The multi-phased project is carried out by six Dutch knowledge institutions across four regions and structured around three Work Packages (WPs):

- LC pilot implementation and evaluation across regional and national levels.
- Developing a joint portfolio of learning pathways on systems integration.
- Development of a platform and joint approach of knowledge sharing across the different levels of communities.

Key insight of the first inventory and evaluation of WP 1 and WP 2 are presented.

Key insights

Seventeen micro-, four meso-, and one macro LCs were developed. Knowledge was mainly shared at regional levels (North-West, North, East and South-West). Five thematic learning paths and over 100 educational products (including 40+ courses for professionals) have been mapped via the Topsector platform (in Dutch, see Figure 1). In addition, for WP 3, contributions have been made to three national events, with two more scheduled before July 2026 and an active LinkedIn communication set-up. The design guidelines for the platform are developed and currently implemented.

Lessons Learned WP 1:

- A Learning Community requires a group of stakeholders with a common challenge as a start.
- Each LC engages multiple stakeholder categories, including students, experts, researchers, industry professionals, municipalities and, in some cases, citizens.
- Bringing these groups together and sharing (new) knowledge and questions needs a facilitator.
- While this facilitator role aligns with that of traditional educational institutions, it also requires new, specific skills.
- Effective governance, tailored to the specific configuration and time investment of each LC, is critical for success.
- Securing sustained commitment from all participants is essential for the long-term viability of each LC.
- A structured process for knowledge transfer is not always present.

Lessons Learned WP 2:

- We have found that for all SI subsystems, there are courses available from the four collaborating regions.
- Learning pathways should be comprehensible and flexible.
- Learning pathways should be related to topics recognizable for the professional.
- The inventory should be updated periodically, and could be extended for other educational institutions.
- Educational institutions can clarify what they offer besides programs, courses, and modules in terms of knowledge products and knowledge sharing.

Conclusions

Learning Communities on SI in the regions demonstrate a wide variety in both form and scope, reflecting the diverse contexts in which they are embedded. A joint learning portfolio should be structured by topics recognizable for professionals. Knowledge sharing within and among LCs is a complex process, requiring considerable effort and robust coordination at macro, meso, and micro levels to ensure meaningful exchange and impact.

Figure 1 : Excerpt of the Inventory of the joint portfolio of learning pathways on systems integration per region.

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BIO4CE: GREEN, DIGITAL AND CIRCULAR INNOVATION IN VET FOR BIOTECHNOLOGY & PHARMACEUTICAL LABS

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BIO4CE is a European CoVE project involving 19 partners that integrates circular economy, green chemistry and digitalisation into VET training, enabling future technicians to adopt energy-efficient, safe and sustainable laboratory practices across the biotechnology and pharmaceutical sectors.

"Empowering Europe's green-skilled technicians"

Method

BIO4CE unites educational innovation, digitalisation and industry collaboration to create sustainable VET training. Partners update curricula with circular economy, green chemistry and low- energy lab practices, developing shared resources and pilots that improve through ongoing feedback.

CIPFP Vicente Blasco Ibáñez pilots & actions

CIPFP Vicente Blasco Ibáñez applies BIO4CE through pilots integrating sustainable lab design, low-energyworkflows, 3D printing and CLP-compliant practices.
Students develop eco-labels, green lab proposals and digital materials through project-based learning.

Key outputs & innovation highlights

BIO4CE delivers practical tools such as green-lab guidelines, interactive learning resources, micro-credentials and digital collaboration environments. These outputs help VET centres adopt circular practices, reduce energy use and improve laboratory efficiency and safety, while strengthening green and digital competences in biotechnology and pharmaceutical training.

Conclusions

- BIO4CE modernises VET by integrating circular, green and digital practices.
- The project improves training with safer, energy-efficient and industry-aligned laboratory workflows.
- Its tools equip students with key green and digital skills for Europe's transition.

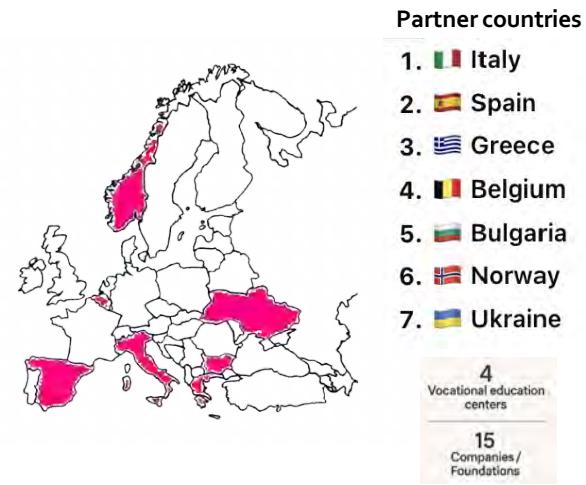

Figure 1. Geographical distribution of the BIO4CE CoVE project members.

Pilot area	Main focus	Student output example
Sustainable lab design	Green / circular labs	Eco-lab proposals
Low-energy workflows	Energy efficiency	Optimised low-consumption workflows
3D printing	Innovation / prototyping	3D-printed lab tools
CLP-compliant practices	Safety & regulation	Correct CLP labels & SDS checks
Digital materials	Digital competences	Interactive posters & resources

Figure 2. BIO4CE pilot areas, focus and student outputs.

Figure 3. Key professional competences strengthened by BIO4CE CoVE project.

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COPPER

*Creating, Optimizing and Planning Positive EneRgy districts: connecting citizens' energy at different geographical levels

Ronald van Buuren, Paul van Kan, Maarten van den Berg - HAN University of Applied Sciences

The overall objective of the COPPER project is to increase and expand the engagement of citizens within and across Energy Communities to create Positive Energy Districts on different geographical levels, by facilitating energy information supply and communication between citizens, modelling energy systems for a balanced energy system and improving strategic and integrated spatial energy planning.

"Everybody has an energy bill"

HAN's task

HAN translates the models of energy systems into a tangible and intuitive form: a game-like environment called the "Smart Energy Table".

Approach

- Student projects (Bachelor, Master)
- Researchers laying the Python software foundation
- Transition from
  - https://pypsa.org/ to
  - https://www.pandapower.org/
- Adding https://www.pandapipes.org/

Application

User groups at

- Municipalities
- Energy Communities
-

Project partners

Radboud Universiteit

EBO Consult

Eigersund kommune
Sammen for alle

Ruralis
Institutt for rural- og regionalforskning

AALBORG UNIVERSITET

iscte

Design of the smart energy table

Proceedings of the Second International Conference on Sustainable Energy Education (SEED 2026): Poster Presentations. Utrecht, the Netherlands, 24-25 March 2026

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SEED
sustainable energy education