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Guidance Document on learning approaches, methods, and practices for a Greener Education

Work Package 2

Innovative Approaches

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1. Introduction

This report intends to address a range of innovative approaches and ground-breaking methods for the Green VET Network to rely on to deliver a greener education within the manufacturing of five industrial sectors. The methods researched were:

- Students centred approach
- work-based learning
- analysis of actual case studies taken from the local context
- collaborative approaches
- digital tools

Additionally, the document maps and identifies the existing national and European legislation and policies supporting green and digital transitions. Also, it identifies and compares practical approaches, methods, and practices to be used by VET Systems, describing their fields of applications, objectives, advantages, and limitations. The five industrial sectors were chosen from automotive, batteries, defence, energy, additive manufacturing and maritime.

Partners were encouraged to research and develop examples and to use credible cases to implement in the desk research to support the approach towards enhancing trainers' and workers' green knowledge, skills, and attitudes. The most appropriate and suitable methods were selected based on our internal analysis to be used further in the project scope. Selected methods and approaches will be evaluated below.

Furthermore, the document will support and feed WP3 (Skills for the Green Transition Work Package with a focus on the development of Competence Units/Curriculum) and WP4 (Piloting the Green Transition) by defining the approaches identifying and supporting the development of the Green Skills, training materials and pilot's implementation.

1.1 Methodology used for selected innovative approaches

As stated above, the focus and identification of ecosystems across the industrial sectors were achieved successfully and with multiple examples by many partners. The partners were allowed to follow pre-defined and approved templates to identify innovative approaches, methods, and practices used in VET Systems. The goal was to find numerous examples across the partners' nation-based VET and within the European Union.

While selecting the impact of the case studies followed by the best practices, we examined templates fulfilled and received by partners. We selected one of every partner to be presented in the guidance document. Therefore, we have identified the sectors followed by the assignment and selected one of each to cover them adequately to be presented throughout section 2 below. Also, we focused on information from the examples about benefits and lessons learned to provide a summary for the readers.

In the next section, you will find the best results from partners, although not every partner qualified to be presented in the section. Nevertheless, all partners' examples will be provided in the document's annexe under section 5.

2. Results Identified from Project Partners

Project partners identified national, and EU approaches in different industrial sectors (e.g. automotive, batteries, defence, energy, additive manufacturing and maritime) and educational institutions. The results from the partners' research are further presented in more detail below. The scope of the subsections is to highlight every ecosystem researched by partners and summarize the results.

2.1 Sustainability in Additive Manufacturing

Partner EWF found a new competence unit (training module) – Sustainability in Additive Manufacturing (AM). The Competence Unit aims to raise the awareness of all AM Professionals, including AM operators, Designers, Supervisors and Engineers, for the Short Term. It covers circular economy and Life Cycle Assessment subjects.

The main benefits were:

- How to incorporate sustainability along the product's life cycle.
- How AM currently implements sustainability and the limitations and possible routes in sustainability (advantages and limitations).

Within this course, the participants are expected to gain the following skills:

- Spot ideas and opportunities for alternative, more sustainable, simple solutions for daily AM activities.
- Name advantages and disadvantages of AM sustainability topics.
- Identify cases and examples for which AM may lead to more sustainable products.
- Take the initiative to suggest more sustainable choices along the AM product life cycle.

The Lessons learned were:

- The knowledge and skills acquired in the training
- Course structure, contents, coherence training tools and trainers' performance
- Dynamics and interactions – breaks to allow break out rooms and discussion sessions
- Use of examples in the form of case studies
- Relevance of the course to your job activities

2.2 Using Digital Tool for Developing a Digital Teaching Platform

The ETF developed the Enhance Digital Teaching Platform. This online platform supports innovation and use of technology in teaching and training by offering free, bite-sized, certified, online self-learning modules mapped to the Digital Teaching Professional Framework, the UK's National EdTech Competency Framework. It helps VET teachers use digital and other new technologies for training and learning.

The Enhance Digital Teaching Platform uses training modules designed to improve the use of technology in teaching and assessment to improve learners' experiences and learner

outcomes. The platform supports teachers in the VET sector in England to use technology in their classrooms across the further education and training sector. The platform hosts free, bite-

size, certified online self-learning training modules that support innovation in teaching and training to improve learners' outcomes. Some of the modules are specifically designed to help teachers organize activities aimed at developing students' soft skills and making use of technology.

The platform also provides the following benefits:

- Free, bite-size, certified online self-learning training modules mapped to the Digital Teaching Professional Framework (DTPF).
- An achievements badge system to reward Exploring, Adopting and Leading.
- A user-centred, mobile-first design to make it easy for you to access anywhere and anytime on any device.
- Facilities to build a community of practice.

It is critical to adopt a user-centred design process – to make sure that what you are developing is fit for purpose and meets the needs and expectations of your target audience.

- It is also essential to understand learners' journey – and to ensure that your development is fully inclusive and accessible.
- Cost constraints and sustainability must be taken into account.

2.3 Working-based Learning Approach for Close Collaboration with Institutions

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A block of a life-size vessel was built in an educational environment but provided a naval work environment for students. Work conditions of a real shipyard were simulated. Use of the block The assembly process (not usual in Educational Training methodologies), Industry 4.0 (welding with ABB robots), and teaching focused on labour market requirements.

Collaborative approach: close collaboration between institutions, i.e. shipyards, auxiliary companies and the VET centre. Direct knowledge transfer from companies to students.

CIFP Ferrolterra is a technical VET school located in Ferrol (Northwest of Spain), where Navantia, one of the essential shipyards in Europe, is also settled. Once they have completed their VET degree, most students are employed either by Navantia or by one of the related auxiliary companies. The Freeboard PE's main goal was to provide a naval work environment for students and to simulate the work conditions of a real shipyard, which is the most likely workplace for local students in the future. As a result, a real-scale part of a ship's hull was constructed.

VET students of Welding Boiler making and HE students of Metallic constructions improved their skills in tubular welding and assembly work, "learning by doing" during the construction phase of this project, facing actual working conditions. Block Assembly Process and the same standards and methodologies as in shipyards were applied in this Pilot Experience.

For Students; "Learning by doing". Students acquire practical experience, which helps them hit the ground running once they begin their full-time job. Acquisition of a broad range of soft

skills, competencies and behaviours which are difficult to develop outside of an actual workplace, for example, attitudes towards work, including taking responsibility, meeting deadlines, knowing how to act in a given situation, communication, teamwork, customer relations skills, project planning and problem-solving skills. They are better understanding the workplace culture and its expectations and acquiring good work habits. The possibility of being hired by the company increases due to students' familiarity with their working environment and methodology. Possibility to earn a salary and contribute to the Social Security Services for two year-training periods. Practical experience maintaining the students' motivation. Coordination, teamwork and responsibility are the keys to success for smoother school-to-work transitions. To find out what they like and what they do not like. If students do not enjoy the job, they will know what they do not like.

For the companies, Train future employees in the company's culture and work habits: systematic training and long-term staff development. The training minimizes the risk of disappointment when just filling a vacant position. Trainees are tailored according to the company's needs. Recruitment costs reduction. Improvement of the company's competitiveness by improving its human resources management: the company will be provided with human resources with professional skills and abilities. Meet and train potential employees, bringing freshness and new ways of doing things and may become the generational relay.

It is crucial for the cooperation of the educational centre in the definition of the student's Learning Plan, so the company mentor can identify the competences and learning outcomes the student must achieve during their stay in the company and establish activities and tasks to be carried out appropriately. It is necessary to hold regular feedback sessions with all the stakeholders. The dates for these feedback sessions should be established at the program's start; otherwise, the meetings probably will not happen. Use virtual learning tools to ensure that students are not required to attend many hours in class.

2.4 Green Diving - Enhancing Green Skills, Sustainability and Attractiveness of Maritime VET

Green Diving rationale was built taking into consideration three needs levels:

- European relevance and need expressed in the field of green skills and sustainability capacitation of educational actors, including in the field of Maritime training at various levels (capacity building, resources provision, curriculums update, structures, and processes greening) – confirmed by fundamental studies (Cedefop, UNESCO, UNEVOC) and projects (MATES, SKILLSEA, ONBOARD);
- Consequently, identification/confirmation of target group needs within VET partners schools and others not making part of this consortium was assessed through a need analysis questionnaire. A total of 120 answers were collected across 4 countries

(Germany, Latvia, Spain and Portugal). Among the results, it must be highlighted that 60% of respondents considered that the maritime VET training is NOT designed to promote green competences, and nearly 40% didn't know how to answer this question.

This toolkit offers tools, materials and resources to enable VET maritime teachers and VET maritime schools to integrate, explore and develop green and sustainability skills within the macro level (school level) and micro level (classroom/students' level).

This digital tool will provide theoretical information and didactic digital materials to be used by teachers and school leaders in their educational institutions to provide Green Skills and competencies for trainers and students.

The document will be based on a set of Green Skills and competencies established by the consortium, constituted of specialists in the field. However, the content and set of competencies built will also consider the existing resources and sustainability projects, like Green Comp, ESCO, and SKILLSEA. Thus, the document will present a set of class plans and projects/activities to be implemented in schools and classrooms based on each skill defined.

Furthermore, as this Digital toolkit for Green Skills aims to foster and promote the attractiveness of blue careers among VET students (future maritime/blue professionals) and common pathways students, this document will provide and present a list of maritime pathways.

The Green Diving project has a clear twofold objective which has at its grassroots the development of pedagogical teaching resources, capacity building and co-designing processes that will convey:

- 1) Sustainability and green skills development in maritime VET, by working on VET students' level (future maritime professionals), as well as VET teachers/trainers and Maritime VET school directors,
- 2) The elevation of VET and Maritime professions attractiveness among school communities.

It is essential to underline that all the content presented in the toolkit will consider the partners' VET school's specific offer and both EQF 4 and 5 levels: fishing; maritime transport; ports and shipping management; marine engineering. Furthermore, all the content will be translated into Portuguese, Italian, English, Spanish and German and available on the project's website without additional costs.

2.5 Student-Centred Approach, Cross-Disciplinary Learning, Collaboration Across Schools and Disciplines

The Basque Country has successfully led its economic recovery. TKNIKA is a centre established by the Basque Deputy Ministry of Vocational Education and Training to promote innovation,

creativity, and entrepreneurship in the region's vocational education and training (VET) centre. As part of its mandate, Tknika developed the Ikasenpresa programme.

The curriculum outlined a compulsory "Business and Entrepreneurial Initiative" module for all vocational education and training (VET) students. As teachers were expected to implement the integrated curriculum and foster the development of the entrepreneurial culture of their students, they required support via materials and methodologies.

The Basque Centre of Research and Applied Innovation in VET (TKNIKA) responded by developing the Empresa Joven Europea (EJE) programme in 2005, followed by the launch of Ikasenpresa in 2012. Ikasenpresa helps teachers build their "business and entrepreneurial initiative" module by providing them with learning materials, hosting annual events such as the Ikasenpresa fair, and facilitating peer learning.

The main project benefits were as follows:

- Practical project-based approach
- Peer-to-peer learning
- Collaborative approach
- Student-centred - Students take the lead in developing business ideas
- Real product experience
- Ikasenpresa provides freedom to teachers while providing a viable framework
- Students are encouraged to interact across disciplines and schools
- Tested and established program
- Material is updated every year

Ikasenpresa facilitates cross-school cooperation where students from different centres gather to work on soft skills. Through lectures, group discussions and teamwork, students from different backgrounds exchange their experiences, gain knowledge about valuable skills, and work together to put them into practice. Students can interact with those from different VET centres and learn about the diverse ways one can be involved in a business.

2.6 Digital Tools – Simulation-based Education for the PV and Storage Optimization Tools

The «PV and Storage Optimisation Tool» is an online tool to enable installers and prosumers to evaluate the economic viability of a PV+Storage system. The tool considers parameters such as detailed load and production profiles, electricity costs, supporting schemes, etc. The user enters various inputs: electrical consumption, solar irradiation, PV and battery size, and electricity costs. The tool calculates the Levelised Cost of Electricity, the Net Present Value and the Internal Rate of Return. The tool may be used to estimate the best PV+Storage system sizing from an economic point of view.

The «StoRES Living Lab» provides an interactive web platform which displays data collected from the project «StoRES» pilot sites (or any other pilot site provided that the data input is in

the same format as that underpinning the tool) and allows users to experiment with different parameters that influence energy storage. Different pilot plants can be compared, and a parametric study is also included to assess the sizing of the PV and the BESS. Under the parametric study feature, the user may modify the size of the PV capacity and the BESS size and observe how the performance rates are affected. For each profile, the following values are represented:

- PV production power
- Load consumption power
- Direct PV power use
- Power charged/discharged in/from the battery
- Power imported/exported from/to the grid
- State-of-Charge percentage level

Participants in the «StoRES» stakeholders training received a «Certificate of Attendance» for attending a 2-hour training on Battery Energy Storage. The Certificate had the logos of the institutions involved and, therefore, were recognized in their respective countries. The tools should include upcoming technologies, new policies, etc. Within participating countries and across other countries.

2.7 Digital Tools at Virtual Practical Training in Engineering Fields

Simulated enterprise for technical work in technology companies is a European Social Fund project implemented by the Ministry of Education in partnership with the Politehnica University of Bucharest, Politehnica University of Timisoara, Constantin Brancusi University of Targu-Jiu, conducted between 2011 and 2013.

The project aimed mainly at increasing the employability of university graduates in terms of training and development of the practical engineering skills required by employers by developing and implementing an integrated information platform that simulates real working technology companies and hiring specialists from these companies for students' practical training and for developing supporting materials. These goals were accomplished using an innovative tool for Romanian higher education: simulated enterprise.

According to the project evaluation, done from the perspective of all involved actors (companies, universities, students), the results proved to be positive. The companies were pleased that they were able to provide specific training for the students from the first year of study and to accommodate students with a real working mentality about deadlines, internal communication, discipline, etc.

In the following year, many of the students participating in the project were accepted by the companies for internships participating in joint project research. Companies are expected to cut down the cost of training for their future young employees, who should be better prepared for their careers. The university was happy to be able to provide better practical training and to take advantage of the mentality change for some of the

Students proved to become better motivated for studying and building their future careers.

3. Summary

The green transition has become part of teaching in many ways. It is done through the technologies taught, the examples and assignments used in teaching and by integrating elements of green transition into existing subjects. Followed by the globally agitated sustainable development goals, everyday practices are presented in the guidance document, which support the vision towards working with the green transition.

Green transition is actively used in teaching in the form of the task's students are asked for and the examples used. In pedagogy, the focus is on acting sustainably and getting students to think along the same lines. The technologies relevant to the green transition used in teaching cover everything from green energy technologies to resource optimization.

Overall, the case studies proved that VET methods used for creating greener education purposes had validity and results for the exact case and accompanying the benefits for improving current curricula and education programs.

4. References

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- [6] *UNESCO-UNEVOC Promising Practice in Focus Tknika: Entrepreneurial Culture (Ikasenpresa)*. (n.d.). Retrieved April 27, 2023, from <https://unevoc.unesco.org/pub/promisingpractices-tnnika4.pdf>

5. Annex

IDENTIFY INNOVATIVE APPROACHES, METHODS, AND POLICIES FOR VOCATIONAL EDUCATION AND TRAINING (VET)	
<p>Scope: European, National, Local, or Organisational</p> <p>Focus on: Real case studies where good practices were applied such as - work-based learning, student-centered approach, gamification, simulation, digital tools, collaborative approach and etc.</p> <p>Ecosystem: Cross Sectors</p>	
Organisation Name	Ministry of National Education, Youth and Sports; Ministry of Ecological Transition; Ministry of Agriculture and Food
Approach/Method/Policy Name	Education for sustainable development
Country and Year	FRANCE 2020 - 2021
Target Group, Scope and Sector	<p>The implementation of Educating for sustainable development in schools and to extend it to extracurricular activities, at all times in the lives of pupils and young people,</p> <p>Schools and establishments involving the entire educational community and the school's partners</p> <p>Development sustainability resources :</p> <ul style="list-style-type: none"> • 3 eco-delegate guides • publication of the vademecum "Educating for sustainable development by 2030" • E3D labeling system
Background Information/Summary	The vademecum "Educating for sustainable development by 2030", provides common benchmarks for all stakeholders in ESD, its adaptation to local realities and the requirement for scientific quality and educational consistency, or the provision of a complete corpus of educational resources on the seas and the ocean thanks to close collaboration
Implementation	<p>In the school context, ESD is fully integrated into the "<i>Internats d'excellence</i>", "<i>Cités éducatives</i>" and "<i>Territoires éducatifs ruraux</i>"</p> <ul style="list-style-type: none"> - the E3D labeling system, which recognizes schools, colleges and high schools committed to sustainable development, has been renewed, notably by specifying the labeling criteria and creating a second category for schools in cycles 2 to 4.
Challenges/Limitations Identified	Information not available

Outcomes	"Building Schools - A Field of Possibilities" guide In the first half of 2021, a framework agreement was signed with the Ministry of Ecological Transition; a roadmap was shared with the Ministry of Agriculture and Food.
Benefits	The labeling system promote coherent educational paths in ESD and to link the actions with the institutional, ecological and social realities of the territories
Lessons Learned /Recommendations	Information not available
How it may be used/replicated within your or other organisations	The integration of sustainability into educational centres must be done in a transferable and integrative way. Recognition of these actions is of great value to any organisation.
Comments/Additional information	No comments
References/Links	MENJS: Dossier de rentrée scolaire 2021-2022. https://eurydice.eacea.ec.europa.eu/national-education-systems/france/national-reforms-school-education

IDENTIFY INNOVATIVE APPROACHES, METHODS, AND POLICIES FOR VOCATIONAL EDUCATION AND TRAINING (VET)

Scope: European, National, Local, or Organisational

Focus on: Real case studies where good practices were applied such as - work-based learning, student-centered approach, gamification, simulation, digital tools, collaborative approach and etc.

Ecosystem: Cross sectors

Organisation Name	Flemish Ministry of Education and Training
Approach/Method/Policy Name	Digisprong ('Digital leap') Strengthen the digital competences of all learners, from primary school children to adults. A strong Flemish e-inclusion policy ensures attention is to vulnerable target groups. The measures and actions to facilitate distance learning are framed within the Flemish recovery plan and the pursuit of digital inclusion.
Country and Year	Belgium - Flemish Community 2021 - 2024
Target Group, Scope and Sector	EDUCATION Primary school children to adults
Background Information/Summary	Any information was identified

Implementation	<p>Efforts are being made on 5 fronts for an accelerated digitization policy:</p> <ol style="list-style-type: none"> (1) a digital friendly government, (2) ICT infrastructure, (3) ICT vision and school policy, (4) digital learning resources and (5) ICT skills. <p>Up-to-date ICT infrastructure and the development of an ICT vision and policy for schools are basic conditions for achieving this digital acceleration. To further develop ICT skills among teachers and in school teams in compulsory and adult education, existing initiatives will be reinforced and IT bootcamps for teachers and ICT coordinators will be organized.</p>
Challenges/Limitations Identified	Information not available
Outcomes	<p>A knowledge and advice centre to coordinate and support the many different actions and projects in the field of education from a single framework. The creation of the position of ICT coordinator</p> <p>here are four key areas within this Digisprong initiative:</p> <ol style="list-style-type: none"> 1. A future-proof and secure ICT infrastructure for all schools in compulsory education; 2. A highly supportive and effective ICT school policy; 3. ICT-competent teachers and teacher trainers with appropriate digital teaching resources; 4. A 'Digisprong' expertise and advice centre to serve the education sector.
Benefits	Information not available
Lessons Learned /Recommendations	Information not available
How it may be used/replicated within your or other organisations	Creating a supporting ICT group for teachers and trainers or even a digital resources management shared between schools.
Comments/Additional information	<i>No additional comments</i>
References/Links	<p>https://www.vlaanderen.be/en/authorities/flemish-resilience/the-digital-leap-digisprong</p> <p>https://meemoo.be/en/projects/digisprong-on-the-archive-for-education</p>

IDENTIFY INNOVATIVE APPROACHES, METHODS, AND POLICIES FOR VOCATIONAL EDUCATION AND TRAINING (VET)

Scope: European, National, Local, or Organisational

Focus on: Real case studies where good practices were applied such as - work-based learning, student-centered approach, gamification, simulation, digital tools, collaborative approach and etc.

Ecosystem: Cross Sectors	
Organisation Name	Minister for Higher Education and Scientific Research, the Government of the French Community
Approach/Method/Policy Name	National reforms in higher education European recovery plan : inter-university research infrastructures to promote green innovation Establishment of five inter-university research platforms designed to promote green innovation and fight climate change.
Country and Year	Belgium - French Community
Target Group, Scope and Sector	<i>High Education</i>
Background Information/Summary	This policy will enable the universities of the French Community to be provided with advanced equipment to carry out scientific research in areas such as energy efficiency, renewable energies, security of supply and the reduction of greenhouse gases. The objective is to rely on the work and collaboration of French-speaking researchers to promote the necessary energy transition of our society.
Implementation	The research infrastructures will be accessible to researchers from all universities. The facilities will also be accessible to other higher education establishments, enabling creative energies to be brought together in one place and ensuring a "lever effect" on the essential themes for the future.
Challenges/Limitations Identified	Information not available
Outcomes	Advanced equipment to carry out scientific research in areas such as energy efficiency, renewable energies, security of supply and the reduction of greenhouse gases
Benefits	This system will also make it possible to accelerate the process of valorisation of results and to attract high-level international researchers within the institutions of the French Community, allowing the universities to be part of collaborations with an international scope. - these research infrastructures will also allow students and professors to have access to advanced learning material.
Lessons Learned /Recommendations	Information not available
How it may be used/replicated within your or other organisations	Information not available

Comments/Additional information	<i>No additional comments</i>
References/Links	https://eurydice.eacea.ec.europa.eu/national-education-systems/belgium-french-community/national-reforms-higher-education

IDENTIFY INNOVATIVE APPROACHES, METHODS, AND POLICIES FOR VOCATIONAL EDUCATION AND TRAINING (VET)

Scope: European, National, Local, or Organisational

Focus on: Real case studies where good practices were applied such as - work-based learning, student-centered approach, gamification, simulation, digital tools, collaborative approach and etc.

Ecosystem: NAVAL INDUSTRY

Organisation Name	<p>Naval Fire Fighting Training & Education System</p> <p>Partners:</p> <ul style="list-style-type: none"> - Danaos shipping company limited - Intelligence for environment and security solutions - Ministry of national defence
Approach/Method/Policy Name	Training is provided through an on-line platform, called NAFTES Etraining, which includes the use of rich media content, interactive content, innovative tools, mobile apps and AR (Augmented Reality) applications.
Country and Year	Cyprus /Italy /Greece 2018
Target Group, Scope and Sector	Crew members and staff of engineering premises on facing effectively fire situations – Naval Industry
Background Information/Summary	NAFTES was based on an innovative idea at developing a holistic Naval Fire Fighting Training and Education System (NAFTES) to complement existing training infrastructure available in a special Unit of the HMOD (Hellenic Navy, Naval Training Command). The innovative aspect of the project was the development of specialized content, currently missing by the training and content market, but highly demanded from the naval industry, i.e., content for training crew members and staff of engineering premises on facing effectively fire situations. In addition, the business aspect of the project was to highly increase the training capacity of the Damage Control School, in order to meet the challenges and needs of modern maritime businesses. Finally, the technological innovation was the integration of Augmented Reality (AR) technologies, interfaces and equipment, for on-site training, enhancing NAFTES drills and exercises.
Implementation	Information not available

Challenges/Limitations Identified	Information not available
Outcomes	<p>The User Requirements Report made clear the need for onboard training, teleconference facilities, more AR Scenarios, in addition to the online blended firefighting training. The report includes analysis and discussions on the current state of art, good practices, pedagogical approaches, and the needs of the target groups. The main results had a major impact in the way that NAFTES was designed.</p> <ul style="list-style-type: none"> - The NAFTES Fire Fighting Toolbox aimed at developing original, high quality and interactive educational materials for NAFTES Firefighting Training that follow the requirements and the standards of both adult and vocational training. It includes: a) the NAFTES Fire Fighting Training Curriculum an outline of the two different levels of Fire Fighting Training – A. Basic Firefighting, B. Advanced Firefighting, b) Course modules design and development of all training materials, c) Video shooting complete firefighting scenarios into the Fire Simulator in the HN Damage Control School and d) Translations into partners’ languages: en, it, el. - The NAFTES eTraining Platform and AR Application supports the delivery of all materials of the project and make online interactive tools such as teleconference, online synchronous and asynchronous communication, interactive modules, self-assessment exercises, etc. All educational materials are also presented open to the public through the NAFTES Open Digital library. Additionally, the NAFTES Etraining platform support the content downloading and its offline usage (without the need of Internet) supporting onboard training. - NAFTES Mobile Etraining application is a native app that provides an alternative means of accessing the materials hosted in the NAFTES Etraining platform and can be used as a virtual information and learning environment as well as for disseminating the project results. - NAFTES Firefighting AR Apps is one of the most important innovations introduced by the project and can be used as a tool for acquiring knowledge, motivating and encouraging trainees. At the NAFTES application only one AR App for Hololens Glasses was promised, but finally 3 different AR application for mobile devices and 3 for Hololens glasses were developed. <p>https://ec.europa.eu/programmes/erasmus-plus/project-result-content/c5a23b3d-c32a-48bb-88be-3d3b72fe0feb/O4 - _NAFTES_VALIDATION_REPORT.pdf</p> <p>https://etraining.naftes.eu/main/toolbox.php</p> <p>https://etraining.naftes.eu</p>
Benefits	Increase significantly the training capacity of the Damage Control School and can be considered as a stable basis for building new training activities for ship crews and for the personnel of any kind of engineering premises.
Lessons Learned /Recommendations	Information not available

How it may be used/replicated within your or other organisations	Information not available
Comments/Additional information	<i>Erasmus * good practice - Project Reference:</i> 2016-1-EL01-KA202-023676
References/Links	<provide used references, documents, materials, videos, or other links> http://www.naftes.eu . https://ec.europa.eu/programmes/erasmus-plus/project-result-content/a964cfde-ec91-4341-b900-8c7e76bd77cc/O3 - NAFTES HOLOLENS GLASSES.pdf

IDENTIFY INNOVATIVE APPROACHES, METHODS, AND POLICIES FOR VOCATIONAL EDUCATION AND TRAINING (VET)

Scope: European, National, Local, or Organisational

Focus on: Real case studies where good practices were applied such as - work-based learning, student-centered approach, gamification, simulation, digital tools, collaborative approach and etc.

Ecosystem: cross several ecosystems

Organisation Name	The Flemish Community of Belgium underwent a reform of the VET system and switched from an apprenticeship model to a dual learning system. https://onderwijs.vlaanderen.be/sites/default/files/2021-07/Final%20report%20SRSP%20Flanders%2010072020.pdf
Approach/Method/Policy Name	The Flemish Education switched from an apprenticeship model to a “ Dual Learning System ,” combining learning in the classroom with learning in the workplace for young minds. A dual programme is a vocational programme of secondary adult education in which adult students acquire the competences leading to a vocational qualification (VET) partly in the institute for adult education (school component) and partly in the workplace (workplace component). The company is jointly responsible for the training and the achievement of the learning objectives. The educational institute remains overall responsible for the learning pathway and the qualification.
Country and Year	Flanders of Belgium in 2019-2020.
Target Group, Scope and Sector	It targeted the secondary education system, notably young people from the age of 15 to better prepare them for the labour market in different industrial fields. In this way, schools can keep young people better motivated and train them in an even more practice-oriented way. On this note, companies train young workers who, after their training, have all the relevant knowledge and skills and integrate them smoothly into the workplace.

Background Information/Summary	<p>Dual learning is a learning pathway for young people from the age of 15 in which they can choose to combine learning in the workplace with learning at school in order to achieve a professional or educational qualification and better prepare themselves for the labour market. It is a fully-fledged learning path alongside full-time secondary education. The key difference is that students acquire skills in dual learning predominantly in the workplace.</p> <p>Companies and schools are fully committed to this learning path and have a mutual interest: schools want to keep young people motivated and train them as well as possible. Companies need young people with the right knowledge and skills. Students enjoy a challenging learning experience – a clear win-win-win situation.</p>
Implementation	<p>The Flemish Ministry of Education and Ministry of Work defined the content of 23 additional dual learning courses. These include courses that lead to qualifications such as bread and pastry chef, welder or painter. After 3 years of intensive testing, dual learning was launched in 2019 – 2020.</p> <p>This school year, there are more than 80 dual training courses. The Flemish Government wants to expand the offer even further. Next school year, Flanders wants to reach the threshold of 100 dual courses in so-called standard trajectories. These trajectories guarantee that all courses in each area are of high quality.</p>
Challenges/Limitations Identified	<p>Information not available</p>
Outcomes	<p>Last year, there were around 2,800 students taking dual learning courses.</p>
Benefits	<p>The Dual Learning contributed to solve 3 challenges:</p> <ul style="list-style-type: none"> - Improve link education – labor market. - reduce drop-out of unqualified learners. - reduce youth unemployment
Lessons Learned /Recommendations	<p>Information not available</p>
How it may be used/replicated within your or other organisations	<p>Information not available</p>
Comments/Additional information	<p><i>No additional comments</i></p>
References/Links	<p>https://onderwijs.vlaanderen.be/sites/default/files/2021-07/Final%20report%20SRSP%20Flanders%2010072020.pdf</p>

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Ecosystem: cross several ecosystems

Organisation Name	The Education and Training Foundation (ETF) is the expert body for professional development and standards in Further Education (FE) and Training in England.
Approach/Method/Policy Name	The ETF developed the Enhance Digital Teaching Platform https://enhance.etfoundation.co.uk/ , an online platform that supports innovation and use of technology in teaching and training by offering free, bite-sized, certified, online selflearning modules mapped to the Digital Teaching Professional Framework, the UK's National EdTech Competency Framework. It helps teaches in VET systems to use digital and other new technologies for training and learning.
Country and Year	Launched in January 2019 in England.
Target Group, Scope and Sector	It aims to support VET teachers in the use of new technologies and innovative pedagogical approaches.
Background Information/Summary	The Enhance Digital Teaching Platform uses the training modules are designed to improve use of technology in teaching and assessment to improve learners' experiences and learner outcomes. The platform supports teachers in VET sector in England to use technology in their classrooms across the further education and training sector. The platform hosts free, bite-size, certified online self-learning training modules that support innovation in teaching and training to improve learners' outcomes. Some of the modules are specifically designed to help teachers organise activities aimed at developing students' soft skills making use of technology.
Implementation	<p>The initiative was implemented in response to the findings of the National Training Needs Analysis, carried out in 2017. A positioning review undertaken by ETF in 2018 to understand the barriers to and the enabling factors for the use of technology in teaching and training likewise informed the design of the Enhance platform. The Department for Education funded digital teaching solution to offer free use of modules to support innovation in teaching and training and to improve learner outcomes and equipping learners.</p> <p>The Platform currently hosts two fully-subsidized training offers to support teachers and trainers in using educational technology (EdTech) and developing their digital skills:</p> <ul style="list-style-type: none"> - The EdTech in Teaching and Training Continuous Professional Development (CPD) programme is designed to help teachers and trainers develop and refine their practice using technology. - The Essential Digital Skills (EDS) programme aims to support staff who already are or who will be delivering qualifications relating to the UK's new legal digital entitlement – the Essential Digital Skills Qualifications (EDSQs) and the Digital Functional Skills Qualifications (DFSQs)

Challenges/Limitations Identified	<ul style="list-style-type: none"> - Issues such as teacher/trainer technophobia, lack of confidence, lack of ability, and lack of a common understanding of what good practice in EdTech looks like were major challenges. Likewise, there was initial resistance to the concept of microlearning, with some educators doubting that you can learn anything useful in the space of 5 minutes. However, ETF's main objective was to shift mindsets and to plant the seeds of what is possible with technology, and what is possible in 5 minutes. - The use of technology is a fast-changing landscape, and content needs to be regularly updated to remain valuable. - During lockdowns, ETF needed to support educators to deliver remotely. ETF took steps to manage that crisis by setting up online webinars and developing a new category of microlearning modules – the Connected and Effective modules – dedicated to supporting educators in delivering in learning remotely.
Outcomes	<ul style="list-style-type: none"> - Teachers'/trainers improved digital and pedagogical skills and propensities to apply these skills in their teaching and training practices. - Continuous skills upgrading by teachers/trainers owing to the platform's gamification features and digital badge system. - Development of strong communities of practice and a database highlighting effective practices in technology-assisted teaching and training - Registrations on the platform in April 2022 were about to hit the 15,000 milestone. More than 29,000 digital badges have been awarded since the platform was launched in January 2019.
Benefits	<p>The platform provides:</p> <ul style="list-style-type: none"> - Free, bite-size, certified online self-learning training modules mapped to the Digital Teaching Professional Framework (DTPF). - An achievements badge system to reward Exploring, Adopting and Leading. - A user-centred, mobile-first design to make it easy for you to access anywhere and anytime on any device. - Facilities to build a community of practice.
Lessons Learned /Recommendations	<ul style="list-style-type: none"> - It is critical to adopt a user-centered design process – to make sure that what you are developing is fit for purpose and meets the needs and expectations of your target audience. - It is also important to understand learners' journey – and to make sure that what you are developing is fully inclusive and accessible. - Cost constraints and sustainability must be taken into account.
How it may be used/replicated within your or other organisations	Information not available
Comments/Additional information	<i>No additional comments</i>
References/Links	https://unevoc.unesco.org/pub/promising_practice_education_and_training_foundation.pdf

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Ecosystem: cross several ecosystems

Organisation Name	<i>The European Commission</i>
Approach/Method/Policy Name	<p>The SELFIE (Self-reflection on Effective Learning by Fostering the use of Innovative Educational technologies) for work-based learning (WBL) is a free tool for Vocational Education and Training (VET) schools and companies in embedding digital technologies into teaching, learning and training.</p> <p>SELFIE WBL helps schools and companies become fit for the digital age. It is a specific part of the SELFIE tool, adapted to match the requirements of work-based learning. In this way, it supports the digital transition, one of the key policy priorities of the European Commission.</p>
Country and Year	Launched in January 2021 within a European level.
Target Group, Scope and Sector	SELFIE WBL involves VET school leaders, VET school teachers, VET learners and In-company trainers in a collective reflection on technology use.
Background Information/Summary	<p>The platform was first launched in 2018 as part of the Digital Education Action Plan. In early 2020, a feasibility study on adapting the SELFIE tool for work-based learning systems in VET concluded there is a need for a SELFIE for WBL to bring VET institutions and companies closer together to jointly discuss how to best embed digital technology in the education and training provided. This is why SELFIE for WBL not only gathers the three perspectives of school leaders, VET teachers and learners, but also adds as a fourth perspective the view of in-company trainers.</p> <p>The tool is funded through the Erasmus programme and has been developed with a team of experts from schools, education ministries and research institutes across Europe. Partner institutions include the European Training Foundation, the European Centre for the Development of Vocational Training (CEDEFOP) and UNESCO's Institute for Information Technologies in Education. School leaders, teachers and students have been involved in creating and testing SELFIE:</p> <ul style="list-style-type: none"> • 5,000 staff and students gave input into the early design of the tool • 67,000 people, from 650 schools across Europe, took part in the pilot test • SELFIE was tested in primary schools to ensure it could be understood by younger students

Implementation	<p>The SELFIE online tool looks at 6 different digital areas in education: Leadership; Professional development; Teaching and learning practices; Assessment practices; Students digital competence; and Infrastructure and Equipment. The platform anonymously gathers the views of students, teachers and school leaders on how technology is used in their school. This is done using short statements and questions and a simple 1-5 answer scale. The questions and statements take around 20 minutes to complete.</p> <p>Based on this input, the tool generates a report – a snapshot (‘SELFIE’ :-)) of a school’s strengths and weaknesses in their use of technology. SELFIE is available for any primary, secondary and vocational schools in Europe and beyond, and in over 30 languages. It can be used by any school – not just those with advanced levels of infrastructure, equipment and technology use.</p>
Challenges/Limitations Identified	The platform does not cover sector-specific issues and apprenticeship which are one of the vital parts of VET schools.
Outcomes	It exists in over 35 languages and has been used by around 770,000 users, i.e. teachers, school leaders and learners in over 7000 schools in 56 countries. The SELFIE tool can support schools to use digital technologies for teaching and learning effectively.
Benefits	<p>SELFIE can help a school make informed decisions by reviewing and continuously improving how digital technologies are used for teaching, learning and assessment. It’s benefits are:</p> <ul style="list-style-type: none"> • free • customisable: Because every school is unique, the tool can be customised. Your school can select and add questions and statements to suit your needs. • available in 30+ languages • easy to set up and answer questions • private - no personal data is collected • designed and tested with schools across Europe • tailor-made: each school receives a tailor-made, interactive report which provides both in-depth data and quick insights into strengths and weaknesses.
Lessons Learned /Recommendations	Information not available
How it may be used/replicated within your or other organisations	SELFIE can help VET providers have a better understanding of how digital technologies are used to support teaching and learning.
Comments/Additional information	<i>No additional comments</i>

References/Links	https://education.ec.europa.eu/sites/default/files/selfie-info-factsheet_en.pdf https://education.ec.europa.eu/selfie/about-selfie
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IDENTIFY INNOVATIVE APPROACHES AND METHODS FOR VOCATIONAL EDUCATION AND TRAINING (VET)

Scope: European, National, Local, or Organisational

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Ecosystem: Defence

Organisation Name	CIFP Ferrolterra: http://www.edu.xunta.gal/centros/cifpferrolterra/ Collaborators: Navantia: https://www.navantia.es/en/
Approach/Method Name	Working-based learning: a block of a life-size vessel was built in an educational environment but providing a naval work environment for students. Work conditions of a real shipyard were simulated. Use of the block assembly process (not usual in Educational Training methodologies) and Industry 4.0 (welding with ABB robots). Teaching focused on labour market requirements. Collaborative approach: close collaboration between institutions, i.e. shipyards, auxiliary companies and the VET centre. Direct knowledge transfer from companies to students.
Country and Year	Ferrol, Spain, 2019/2020 Ferrol, Spain, 2020/2021
Target Group and Scope	Students targeted in the construction of the block: <ul style="list-style-type: none"> • Students from Medium Grade in Welding and Superior Grade of Metallic Construction: drawing, cutting, assembly, painting and surface finishing. • Students from Superior Grade in Machining Manufacture Design: Designing and creating Construction and Assembly drawings. • Students from Medium Grade in Machining: mechanical components manufacturing. Professional Departments that can be involved in the School Centre after building the block: <ul style="list-style-type: none"> • Machining manufacture department: Pipes, connections components, painting etc. • Electronic and electricity department: Electrical system (wiring, electrical tubes, connections etc.), communications aerials and all kind of necessary devices. • Energy and water department: Plumbing (pipes, valves, connectors) and solar heating energy components. • Automotive department: Installation, assembly and starting up of engines. • Installation and maintenance department: Electrical and mechanical

	<p style="text-align: center;">maintenance of installation.</p> <p>This pilot experience includes the collaboration of Navantia. Navantia is a Spanish state-owned company reference in the design and construction of high technology military vessels. Students participating in the programme will develop the skills needed in the Defence sector.</p>
<p>Background Information/Summary</p>	<p>CIFP Ferrolterra is a technical VET school located in Ferrol (North West of Spain), where Navantia, one of the most important shipyards in Europe, is also settled. Once they have completed their VET degree, most of the students are employed either by Navantia or by one of the auxiliary companies related to it. The Freeboard PE's main goal was to provide a naval work environment for students and to simulate the work conditions of a real shipyard, which is the most likely workplace for the local students in the future. As a result, a real-scale part of a ship's hull was constructed.</p> <p>VET students of Welding Boiler making and HE students of Metallic constructions improved their skills in tubular welding and assembly work "learning by doing" during the construction phase of this project, facing real working conditions. Block Assembly Process and same standards and methodologies as in shipyards were applied in this Pilot Experience.</p>
<p>Implementation</p>	<p>DESIGN PHASE</p> <p>In the design phase, structural calculations, strength of materials, as well as the manufacturing and assembly drawings were carried out. In addition, occupational risk studies, task planning, manoeuvre planning, and all those factors that may affect construction were carried out.</p> <p>The main steps of the planning and design stage were:</p> <ul style="list-style-type: none"> • Designing and defining technical specifications for the mechanical work. • Understanding technical documentation, doing a state-of-the-art in order to identify materials required for the construction phase. • Assessing costs of the project, using commercial and technical information, manufacturers' invoices, etc., in order to be within the approved budget. • Applying CAD working techniques for the design according to the rules of naval policies. <p>This phase was carried out by Mechanical Manufacture Design students and their teachers.</p> <p>CONSTRUCTION PHASE</p> <p>Regarding the construction phase, the same methodology and designing standards as shipyards, named block assembly process, were used. The block assembly process consists of manufacturing small pieces, called assemblies. These assemblies are joined to a larger one, called a block, and these blocks are joined together into another larger block, the section constructed. In a real shipyard, several sections are made in this way, and joined to complete an entire ship.</p> <p>This phase was carried out by the students of two different speciality degrees: Welding and Boiler making, and Metallic constructions.</p> <p>The main steps of the Construction and Assembly phase were:</p> <ul style="list-style-type: none"> • Solving potential problems in assembly, using economical, safety and practical criteria. • Assembling the structure, following drawings and performing the necessary tests, to monitor equipment and associated elements.

	<ul style="list-style-type: none"> • Identifying standard components that can be used in the design of the block. • Selecting tools and necessary equipment. • Using the techniques to trace, cut, mechanize, welding, etc. describing the operative sequence to cut and assemble the pieces. <p>Navantia provided some of the materials as well as advice on the development of the ship's hull. This ensured that the finished hull was developed in compliance with industry standards.</p> <p>PAINTING PHASE</p> <p>An external company, Blascar shipyard, carried out the grit blasting (abrasive surface cleaning process) after which the students of Welding and Boiler making painted the ship-block in October 2021.</p> <p>In October 2021, the Metallic Constructions students and Mechanical Manufacturing Design students engaged in designing the layout of the interior pipes and valves of the ship. Handrails, exterior stairs and an annex room to store tools was also in the design phase.</p> <p>In the future plumbing (pipes, valves, connectors) and other type components (electrical, heating etc.) will be installed in the block so all departments of the VET school will be involved in the process, as well as performing repairs of the structures.</p> <p>Also four additional courses took place in the framework of this pilot experience:</p> <ul style="list-style-type: none"> • Naval specific vocabulary course <p>A short course about Naval terminology was taught by CT Engineers to 12 students enrolled at the dual course established in collaboration with that company.</p> <ul style="list-style-type: none"> • Upskilling Course on Industrial pipes for workers <p>ASIME organized an 80-hour course in the CIFP Ferrolterra facilities, where the ship-block was used by their students to take measurements and do the stakeout of a pipe installation in it.</p> <ul style="list-style-type: none"> • Specialized welding course for teachers <p>A Course on special tubular welds in aluminium, stainless, carbon steel and the FCAW (Flux Core Arc Welding) process was organized in conjunction with the CIFP Ferrol for teachers. The aim was to upskill the VET teachers in order to be able to transfer these knowledge and skills later on to their students.</p> <ul style="list-style-type: none"> • Health and safety conditions courses: work at heights, fall arrest system <p>An 8-hour training on working at heights was done for 92 participants in 2020.</p>
<p>Challenges/Limitations Identified</p>	<p>Adaptation of students to work in a real work environment.</p> <p>Put theory into practice in the real-life work experiences. Explore what they have learned in the classroom within a real-world context</p> <p>Interdisciplinary work and interaction with different departments.</p> <p>Working following a risk prevention plan.</p>

<p>Outcomes</p>	<p>The outcomes of the Pilot Experiences provide indispensable knowhow for bridging the maritime skills gap and increasing both sectors' overall competitiveness and attractiveness.</p> <p>The constructed ship hull provided a working environment for students to carry out technical training in a setting comparable to real-life. They experienced conditions that they would face in a real work environment. Hands-on training was carried out under controlled conditions with the same materials and design standards as conventionally used in shipyards. Participants learned to carry out the processes of the manufacture, assembly and repair of boiler-making elements, pipes, metallic structures and metallic joinery applying techniques of welding, machining and shaping, and complying with the specifications on quality, labour risk prevention and environmental protection.</p> <ul style="list-style-type: none"> • Applying labour and ethic habits in his/her professional activity according to the characteristics of the job position and the procedures established. • Preparing materials, equipment and machinery for the scribing, cutting, machining, shaping and joining of elements, building structures, metallic joinery and industrial piping installations, in accordance with the established procedures, applying the regulations concerning labour risk prevention and environmental protection. • Machining and shaping sheet metal, profiles and pipes, in accordance with manufacture specifications, applying the regulations concerning labour risk prevention and environmental protection. • Fitting pipes, metallic structures and metallic joinery, complying with the plans concerning labour risk prevention and environmental protection, from the provided technical documentation. • Obtaining welded or surfaced sheet metal, profiles and pipes through electric welding, oxy-fuel gas welding, TIG, MAG/MIG, submerged arc welding and surfaces through thermal or arc spraying from the building plans complying with the plan on labour risk prevention and environmental protection. • Verifying dimensions and characteristics of manufactured pieces, following the instructions established in the control plan. <p>Two companies signed Dual programmes with the CIFP Ferrolterra as a result of the implementation of this PE. With Navantia & CT Engineers in the 2021/2022 academic year and with Gabadi & Windar renovables in the 2022/2023 academic year</p> <p>Improved employability for students from the specialities of welding and boiler-making and mechanical manufacturing design.</p> <p>Student satisfaction surveys show a good overall satisfaction rate: 3.42 out of 4.</p> <p>This PE has also contributed to enhancing VET Attractiveness: Enrolments in the centre increased in 2021/2022.</p>
<p>Benefits</p>	<p>The constructed ship hull provides a working environment for students to carry out technical training in a setting comparable to real-life. They experience the conditions that they would face in a real work environment. Hands-on training can be carried out under controlled conditions with the same materials and design standards as conventionally used in shipyards.</p> <p>Students enhance and develop other professional skills such as:</p> <ul style="list-style-type: none"> • Creativity and innovative ideas, since difficulties and problems will appear during construction process. • Decision-making skills, merging multidisciplinary knowledge and work, taking risks in order to be able to respond appropriately to unforeseen problems.

	<ul style="list-style-type: none"> • Teamwork and leadership, due to working with several departments, classmates, etc. • Create Health and Safety conditions: work at heights, fall arrest system, address with handling loads, working in confined spaces, etc. <p>VET quality and attractiveness can increase due to this new approach in in teaching, focused on labour market requirements.</p>
Lessons Learned /Recommendations	<p>It is recommended that the following key learning elements should be taken into consideration:</p> <ol style="list-style-type: none"> 1. Working with industry collaborators: This is key to ensure that the training follows industry standards and bridges the gap between industry needs and training offer. 2. VET teachers' involvement: This kind of training motivates students and therefore facilitates teachers' work, even though it requires better planning and a different evaluation method. 3. Disseminating progress: This kind of teaching approach will increase student interest for that specific professional path and also the VET centre's reputation.
How it may be used/replicated within your or other organisations	<p>Work-based learning experiences are beneficial for companies as they gain access to job candidates who have the hands-on experience they're seeking. As partners in these initiatives, businesses can ensure that the skills and qualifications trainees acquire are aligned with their specific workforce needs. Also work-based learning programmes help cultivate diversity.</p> <p>Work-based learning programs make the local business climate stronger and promote economic growth by contributing to the creation of a skilled regional workforce. Providing workers with opportunities to earn valuable credentials and develop new skills benefits everyone in the community by reducing unemployment, increasing consumer spending, and attracting new businesses to the area.</p>
Comments/Additional information	<i>No additional comments</i>
References/Links	<p>https://www.projectmates.eu/pilotexperience/freeboard/ https://www.projectmates.eu/wp-content/uploads/2022/03/MATES-Freeboard-Laymans-Report_ME-2-clean.pdf https://www.projectmates.eu/wp-content/uploads/2022/06/LO-Freeboard_final-1.pdf http://www.edu.xunta.gal/centros/cifpferrolterra/node/1490 https://www.lavozdeg Galicia.es/noticia/somosmar/2021/04/13/astillero-mini-aprender-construir-barco-salir-aulaslista-espera-poner-punto-embarcaciones-madera/0003_202104F13C2993.htm</p>

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Ecosystem: Defence

Organisation Name	CIFP Ferrolterra: http://www.edu.xunta.gal/centros/cifpferrolterra/ CT Engineers: https://www.thectengineeringgroup.com/index.php/home/?idioma_id=1&region_id=1 Navantia: https://www.navantia.es/en/
Approach/Method Name	Work based learning: in this partnership between CT Engineers, Navantia and CIFP Ferrolterra students put theory into practice working at CT Engineering and Navantia while they develop their professional skills required to work in the Defence/Maritime sector.
Country and Year	Spain, Ferrol, 2021-2022 Spain, Ferrol, 2022-2023
Target Group and Scope	Students from higher Grade in Machinery Manufacture Design: Designing and producing Construction and Assembly drawings. This dual training program takes place in Navantia and CT Engineers. Navantia is a Spanish Government company, a reference in the design and construction of high technology military vessels. CT Engineers, an international engineering group based in Spain with a site in Ferrol, is one of the companies which provide engineering services to Navantia. Students participating in the programme will develop the skills required in the Defence sector.
Background Information/Summary	CFIP Ferrolterra is a VET school located in Ferrol. Navantia, one of the most important shipyards in Europe, is also located here. This shipyard and its subcontractors are the main economic activity in the area. In order to support training and develop the skills required in this market, agreements are established between VETs and companies, so that students can get experience in real work conditions and acquire the knowledge necessary to work in those companies. CT Engineers and Navantia are some of those companies where the students enhance their skills and abilities, connecting learning with this region's labour force.
Implementation	A collaboration agreement has been established between CT Engineers, Navantia and the CIFP Ferrolterra. In this collaboration agreement the student's Learning Plan is defined, and competences and learning outcomes, which student must achieve during their stay in the company, is clearly identified, establishing properly the activities and tasks to be carried out. In this case the students who will develop their skills at CT and Navantia belong to Mechanical Manufacturing and the aspects that should be trained in the companies are the following: <ul style="list-style-type: none"> • Design of steel process and stamping tools • Business and entrepreneurship • Design of moulds for polymeric products • Manufacturing automation. This collaboration agreement has been approved by the Education Authorities. A total of 15 students take part of this experience: 12 are trained in Navantia and 3 in CT. They are chosen following a selection process where they are scored (till 100 points) on the basis of: <ul style="list-style-type: none"> • The studies they are performing (25 points). • Foreign Languages skills (10 points). • Having the basic level course of 50 hours in Occupational Risk Prevention (10 points)

	<ul style="list-style-type: none"> • Their experience using parametric design software (10 points). • EUROPASS curriculum (5 points). • A psych professional test where the student should achieve at least 15 points if they want to be included in the selection process. This test consists of 20 questions, 10 of them about technical drawing and the other 10 about Mathematics. <p>Navantia and CT have assigned a mentor for the students. This mentor is responsible for the follow-up of the training activity, the coordination of both professional and training activity and for the communication with the vocational centre. Also CIFP Ferrolterra has appointed a teacher in charge of the training scheduling and following up, the evaluation coordination of teachers and mentors and the liaison with the company.</p> <p>The time distribution between the companies and the centre is:</p> <table border="1" data-bbox="550 723 1334 907"> <thead> <tr> <th colspan="2"></th> <th>Year 2021-2022</th> <th>Year 2022-2023</th> </tr> </thead> <tbody> <tr> <td>CIFP Ferrolterra</td> <td>62%</td> <td>690 h</td> <td>558 h</td> </tr> <tr> <td>Company</td> <td>38%</td> <td>270 h</td> <td>72 h</td> </tr> </tbody> </table>			Year 2021-2022	Year 2022-2023	CIFP Ferrolterra	62%	690 h	558 h	Company	38%	270 h	72 h
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CIFP Ferrolterra	62%	690 h	558 h										
Company	38%	270 h	72 h										
<p>Challenges/Limitations Identified</p>	<p>Mentor: It is necessary to increase the value of the mentor's figure as it is vital to student's better service requiring support for their academic and professional integration. Also finding the right mentors to fulfil student interests is essential for the experience.</p> <p>Partnership: in order to succeed, both the VET centre and the companies should significantly invest time and effort towards agreeing a shared agenda. Furthermore, both parties must commit to mutually contribute throughout the relationship.</p> <p>Culture: difference between culture in industry and in higher education. All partners need to understand and realise that the partnership requires compromise by both parties.</p> <p>Programme: decide the best combination of work- and classroom-based learning; how to start programs and then sustain and expand them; how to decide which model of work-based learning is the best for a specific purpose; how to finance programs; and how to ensure the programme high quality.</p> <p>Education Authorities: restrictions when approving the programme.</p> <p>Employer-led efforts are the key to meet the current demand for more work-based learning opportunities. If work and career opportunities are aimed, industry involvement is needed.</p>												
<p>Outcomes</p>	<p>Students' motivation is improved as they put into practice what they have learned at school and, at the same time, participate in the production process and learn in a real working environment.</p> <p>By updating their professional skills, students improve their employability and they are more adjusted to the working world requirements. Students are able to apply for jobs with and specific experience in their speciality and have the required training to get the position and set the foundation for a successful career.</p> <p>Alignment between industry needs and training offer solving the lack of specialized work force.</p> <p>Improved vet image and attractiveness thanks to offering apprenticeships schemes.</p> <p>Creation of synergies with industrial partners and the possibility of launching new partnership projects.</p>												

Benefits	<p>For the student:</p> <ul style="list-style-type: none"> • “Learning by doing”. Students acquire practical experience which helps them hit the ground running once they begin their full-time job. • Acquisition of a broad range of soft skills, competences and behaviours which are difficult to develop outside of a real workplace, for example: attitudes towards work, including taking responsibility, meeting deadlines, knowing how to act in a given situation, communication, teamwork, customer relations skills, project planning and problem-solving skills. • Gaining a better understanding of the workplace culture and its expectations and to acquire good work habits. • The possibility to be hired by the company increases due to student’s familiarity with their working environment and methodology. • Possibility to earn a salary and contribute to the Social Security Services for 2 year-training period. • Practical experience maintaining the students’ motivation. Coordination, teamwork and responsibility are the key for success. • Smoother school-to-work transitions. • To find out what they like and they do not like. If a student does not enjoy the job, he/she will know what he/she does not like. <p>For the companies:</p> <ul style="list-style-type: none"> • Train future employees in the company’s culture and work habits. Systematic training and long-term staff development. The training minimises the risk of disappointment when just filling a vacant position. Trainees are tailored according to the company needs. • Recruitment costs reduction. Improvement of the company competitiveness by improving their human resources management: the company will be provided with human resources with professional skills and abilities. • Meet and train potential employees, bringing freshness, new ways of doing things and may become the generational relay.
Lessons Learned /Recommendations	<p>It is very important the cooperation of the educational centre in the definition of the student's Learning Plan, so the company mentor can clearly identify the competences and learning outcomes the student must achieve during their stay in the company, and establishing activities tasks to be carried out in an appropriate way.</p> <p>It is necessary to held regular feedback sessions with all the stakeholders. The dates for these feedback sessions should be established at the start of the program otherwise the meetings probably will not happen.</p> <p>Use of virtual learning tools to ensure that students are not required to attend a substantial number of hours in class.</p>
How it may be used/replicated within your or other organisations	<p>Nowadays CT Engineers is taking part in two dual training programs in Ferrol site. Some of the current employees were previously students who took part in the dual VET programmes. This is a win-win situation as the student apart from the required technical knowledge acquired throughout their studies he is also provided with hands-on experience. At the end of the training, the student is 100% effective and efficient, directly operational, ready to take advantage of any professional opportunity he/she may find.</p>
Comments/Additional information	<p>CT Agreement with CIFP Ferrolterra approved by Regional Education Authorities of Spanish Government used as basis.</p>

References/Links	https://www.lavozdegalicia.es/noticia/ferrol/2019/06/04/nuevo-ciclo-fp-dual-naval/0003_201906F4C5992.htm https://www.lavozdegalicia.es/noticia/ferrol/2019/06/04/empresa-podra-dirigir-formacion-necesita/0003_201906F4C5993.htm https://www.cedefop.europa.eu/es https://www.etf.europa.eu/sites/default/files/2018-09/Work-based%20learning_Handbook.pdf
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IDENTIFY INNOVATIVE APPROACHES AND METHODS FOR VOCATIONAL EDUCATION AND TRAINING (VET)

Scope: European, National, Local, or Organisational

Focus on: Real case studies where good practices were applied such as - work-based learning, student-centered approach, gamification, simulation, digital tools, collaborative approach and etc.

Ecosystem: Energy

Organisation Name	CIFP Someso: https://cifpsomeso.edu.es/ Collaborators: Navantia: https://www.navantia.es/en/ INDASA: http://www.indasa.com/index.php?lang=en GAIN: http://gain.xunta.gal/?locale=gl_ES
Approach/Method Name	<p>Work-based learning: a windmill turbine was built according to industry standards and procedures but in an educational environment. Teaching focused on labour market requirements.</p> <p>Digital tool: Creation and use of a VR tool to improve the student painting skills. New systems of manufacturing and construction existing in the field of the offshore metal construction were applied to build an offshore structure.</p> <p>Collaborative approach: close collaboration between institutions, i.e. shipyards, auxiliary companies and the VET centre. Direct knowledge transfer from companies to students.</p>
Country and Year	Spain, CIFP Someso, September 2020-June 2021
Target Group and Scope	<p>VET students in the basic, intermediate and upper levels of VET degrees related to the department of Mechanical Manufacturing, specifically in the welding and metal construction sectors.</p> <p>The scope of this project was to provide students with the professional skills required in an emerging energy productive sector (offshore) through innovative approaches and using technologies related to industry 4.0.</p>

Background Information/Summary	<p>The Magnus Effect is focused on offshore wind energy. It is a consequence of:</p> <ul style="list-style-type: none"> • the importance that governments give to green energy, • the awareness of Society towards the necessity of change in the energetic model • Navantia and Windar joint venture in the offshore wind energy market • the Spanish multinational Iberdrola decision to build their jackets in Navantia Fene (Ferrolterra area). <p>As Navantia is a consolidated factory in this area, specialised in the manufacture of this type of structures, the development of new professional skills, suitable for this activity, is required. The PE Magnus Effect aims to respond to these needs by providing the students of CIFP Someso with specific training. To do so, the VET school built a copy of an offshore structure for supporting wind turbines in accordance with the industrial standards and procedures. They were supported, monitored and guided by companies involved in this business sector.</p> <p>Besides the manufacturing processes, this PE also used the offshore wind energy as a common thread to widen the focus. These activities at the workshop and/or classrooms were complemented with technical lectures for students and teachers and a virtual reality tool was implemented for simulating the painting processes used for protecting these structures.</p>
Implementation	<p>The following activities were undertaken:</p> <ul style="list-style-type: none"> • Construction of an offshore jacket <p>The technical documentation was provided by the industrial partner. It had to be adapted to the facilities and resources available in the CIFP to be able to build the jacket.</p> <p>The manufacturing was approached as a cross-cutting and multidisciplinary project where the integration of the professional subjects belonging to the VET degrees involved was sought: technical drawing, process definition, machining, welding, assembly, quality control and cost estimation.</p> <p>The construction of the offshore structure was replicated according to industry standards and procedures but in an educational environment. Automated robot welding and innovative NDT (non-destructive testing) was used in this Pilot Experience within the welding processes and procedures, in order to align with the new technologies driving Industry 4.0.</p> <ul style="list-style-type: none"> • Creation of a virtual reality tool for simulating the painting process <p>The “AIRLESS” VR tool was developed with the UNITY 3D tool. It was designed by CIFP Someso teachers with technical support from INDASA, a company specialized in surface finishing processes in the shipbuilding and offshore sector, and implemented by GAIN.</p> <p>Method of use: The user puts on the HTC Vive goggles and with the control is able to paint a structure on a real scale immersed in a scenario that replicates Navantia Fene facilities, where offshore wind jackets are manufactured The VR tool not only represents faithfully the painting process, but also collects information from the simulation such as times, painting speeds, trigger tightening %, distance from the gun to the piece as well as the angle between the two, paint consumption, etc. and saves it. The trainer can assess the performance of each student and the students can improve their painting skills on large metal structures. It was designed based on data provided by INDASA from real painting processes in naval applications. They not only provided information about painting techniques, materials, consumption..., but also carried out the simulator validation tests.</p>

	<ul style="list-style-type: none"> • Technical lectures for students <p>Lectures for VET students and teachers focused on technologies and applications complemented the practical activities. The following trainings took place:</p> <ul style="list-style-type: none"> ○ technical training about Personal Protection Equipment and ○ technical training about collaborative robotics delivered by Robot Plus. This training was delivered twice, during the second and third quarters of the 2020-21 academic year. All the students had the opportunity of following an online course about programming a Universal Robot cobot as well as working in situ with the equipment. <p>The approach of both activities was eminently practical, looking for the active participation of the students in the dynamics of the lectures.</p> <p>Also depending on the professional profile of the students, several industrial applications were implemented during this training. The target students were mainly those enrolled in technical degrees such as mechanical manufacturing, automotive and wood processing, although there were also participants from other professional fields such as personal image, building and civil works.</p> <ul style="list-style-type: none"> • Development of a technical study about an aerodynamic profile designed to be used in a wind turbine rotor according to the Magnus effect. <p>The purpose of this study was to carry out some initial tests of the Magnus effect through both, computer simulation and in a wind tunnel. They wanted to obtain initial data on the behaviour of these systems, in order to determine their viability, in the future, for its application in practical classes of electricity generation, assess advantages and disadvantages of this process and define in which cases this technology could be applicable.</p> <p>The first tests were based on theory and consisted of computer simulations of rotating cylinders subjected to a steady air flow. The tool used for this simulation was Open FOAM (Open Field Operation and Manipulation). This is a free and open source CFD (Computer Fluid Dynamics) software, which has a wide community of users in most areas of engineering and science, from both commercial and academic organizations.</p> <p>The factors analysed, in order to check how relevant the Magnus effect is, were the following:</p> <ol style="list-style-type: none"> a) Diameter b) wind speed and c) rotation speed <p>For the test done in the wind tunnel, the profile used was a 60 mm diameter cylinder.</p>
Challenges/Limitations Identified	<p>Challenge:</p> <ul style="list-style-type: none"> • It was necessary to adapt the technical documentation provided by the industrial partners to make feasible the manufacturing of the jacket in the CIFP facilities and with the resources existing in the educational centre. • The integration of the professional subjects belonging to the VET degrees: technical drawing, process definition, machining, welding, assembly, quality control and cost estimation. • Development of the VR tool: the googles were based in a GAIN wood varnishing simulator for flat surfaces. CIFP Someso need to develop a paint simulator for curve surfaces. It was also necessary to adapt the initial budget because the price of the chips was increased significantly. There were also logistic problems: the VR tool arrived late.

	<p>Limitation:</p> <ul style="list-style-type: none"> Limited transfer of the experience to other VET institutions due to industrial privacy restrictions on the use of the technical documentation provided by the industrial partners. The jacket built by the students had the same design as the Navantia's jacket installed in Saint Brieuc.
<p>Outcomes</p>	<p>General outcomes: Greater engagement and motivation of VET students due to the use of new educational methodologies. Improved VET student employability thanks to the updating of their professional skills in an emerging productive sector (offshore), not included in the current VET curricula. Updating of current VET curricula to include issues associated with Industry 4.0, such as robotics or VR tools. Learning outcomes from Project-based learning: Participants learned the main concepts & technical vocabulary related to offshore wind energy. They became involved in all the construction phases from design to delivery, so they know the key factors that lead to the manufacture of standardised jackets: modular foundation design, usage of standardised tubes, automated welded nodes and serial assembling. They fitted pipes and other metallic elements using electric welding & following the technical documentation. They acquired labour and ethic habits in his/her professional activity, applied H&S regulations concerning labour risk prevention and environmental protection during the manufacturing activities carried out in the workshop and further developed their soft skills, such as critical thinking, teamwork, problem-solving, and self-confidence among others.</p> <ul style="list-style-type: none"> Learning outcomes from VR tool Participants learned how to paint flat and curved surfaces using a VR tool that simulates real jacket painting conditions. Learning outcomes from personal protection equipment training Students learned the necessity of using PPE and refreshed key aspects that have to be taken into account in their working routine. Learning outcomes from Collaborative Robotics (Cobots) training Students learned how to program and test robots (specifically a cobot from the company Universal Robots) for simple industrial applications as material handling.
<p>Benefits</p>	<ul style="list-style-type: none"> Creation of synergies with industrial partners and the possibility of launching new partnership projects Improved VET curricula filling the gap between the skills required by companies and the training provided in VET centres referring to the implementation of Industry 4.0 through the development of robotics and its application and to the use of the manufacturing technologies used in the production of the jackets. Improved student employability: Offshore wind energy is an ever-growing sector both, globally and locally. The medium-term forecast is for the installed capacity of offshore wind farms to multiply, so the business derived from the manufacture of jackets will continue to rise. In the case of the CIFP Someso local area, this previous analysis is fully valid thanks to the establishment in this market of the joint venture of Navantia and Windar as well as the strength of the Spanish multinational Iberdrola.

	<p>Currently, there is a growing demand for metal professionals to work on this type of projects. Those with specific training in this field have a greater competitive advantage than the rest.</p> <ul style="list-style-type: none"> • Increasing VET quality and attractiveness. The commitment of the students throughout the project was remarkable. In addition, the approach enabled the students' motivation to be maintained throughout the duration of the PE. Coordination, teamwork and a feeling of responsibility for the work carried out by each of the different groups of participating students have been key to the success of the PE. They feel proud of the result: the replica of the jacket. Finally, after participating in this Experience, it is expected that there will be more VET teachers interested in carrying out similar activities with students. A change of mentality is needed and, in the beginning, this approach is more demanding for the teachers involved than the traditional approach. However, the results obtained are worthwhile thanks to the many aforementioned benefits. • The “Airless” VR tool can be used in both educational and industrial environments, as it was designed based on data from real painting processes in naval applications and validated by the industrial partner. It enables a complete monitoring of the entire process and key magnitudes, and therefore it facilitates the trainer’s evaluation as well as the correction of procedural errors. This tool fills an existing gap in the Galician VET students’ training at Welding and boiler-making intermediate level. The lack of material in metal surface finishing training at VET centres can be solved by this resource. Metalworking companies are also interested in the “Airless” VR tool application due to its successful results, i.e., painting process can be realistically simulated. The training of specialist in this area is more simple and cheaper, as it saves consumables and reduces the environmental impact on training. This VR tool has attracted the interest of the Galician Education Authorities. This entity is committed to implement this VR tool at the beginning of the 2022-23 in all public VET centres where intermediate and upper level degrees of welding, boiler-making and metallic construction are being taught. In addition, INDASA, the company involved in the design and validation of the “Airless” is really interested in it for training new workers. It means saving the material resources used at the first stages of the training, reducing operating costs (the paint used for offshore structures or in naval sector is expensive) and it is more friendly-environment.
Lessons Learned /Recommendations	<ul style="list-style-type: none"> • Identify the areas, topics or issues that match the partners’ needs as first step to create collaborative contexts between them. • Encourage students.
How it may be used/replicated within your or other organisations	<p>Limited transfer of the experience to other VET institutions due to industrial privacy restrictions on the use of the technical documentation provided by the industrial partners. The jacket built by the students had the same design as the Navantia’s jacket installed in Saint Brieuç.</p> <p>But the Magnus Effect PE provides a framework for replicating similar activities in other VET institutions across different geographic locations. This project-based education model may be used in any professional field if and when there are supporting companies willing to get involved in it. This is a key factor for transferring the industry know-how directly to VET institutions and their students. It is necessary a close collaboration with companies, in this case, with expertise in</p>

	the ORE sector. Its involvement in the planned educational activities, providing technical information, monitoring on request and verifying the PE results allowed all the objectives to be fulfilled and to make the most of them, achieving great benefits for the students.
Comments/Additional information	<i>No additional comments</i>
References/Links	https://www.projectmates.eu/pilotexperience/the-magnus-effect/ Layman report: https://www.projectmates.eu/wp-content/uploads/2022/05/MATES-Magnus-effect-Layman-Report-1.pdf https://www.projectmates.eu/wp-content/uploads/2022/06/LO-PE04_Magnus-Effect-1.pdf https://www.youtube.com/watch?v=9XISOz5Ts4A https://cifpsomeso.edu.es/category/innovacion/

IDENTIFY INNOVATIVE APPROACHES AND METHODS FOR VOCATIONAL EDUCATION AND TRAINING (VET)

Scope: European, National, Local, or Organisational

Focus on: Real case studies where good practices were applied such as - work-based learning, student-centered approach, gamification, simulation, digital tools, collaborative approach and etc.

Ecosystem: Energy

Organisation Name	Chamber of Installation Specialists in Bulgaria (CISB): https://nisbg.org/en/home-3/ This training activities were implemented following the curricula, teaching methods and training content developed in the frame of the GSS-VET project, slightly adapting them to the requirements of the national legislation if needed. GSS-VET (Geothermal and Solar skills – Vocational education and training) project aims to design and deliver a demand-driven Vocational and education training in response of the targets set up by the EU Directive 2010/31/EU on the Energy Performance Buildings: all new buildings by 2020 to be nearly zero energy buildings.
Approach/Method Name	Project based learning: students would learn how to design small installations or how to interpret a scheme by doing different activities or projects. Three innovative training methods were used: <ul style="list-style-type: none"> • Flipped classroom • Self-training using the specially developed e-Learning Platform of the Project, with personalized access to training content, quizzes, tests, and games. • Work-based module –practical training in a real-life working environment.

Country and Year	<i>Bulgaria, 2020.</i>
Target Group and Scope	<p>The participants were selected according to the requirements of the certification schemes developed for the GSS-VET project and the requirements of the national legislation:</p> <ul style="list-style-type: none"> • at least eighteen (18) years old • hold a valid professional license for electrical works • applicants wishing to participate in the examination for the Advanced Level shall have additionally a minimum of a two (2) years previous professional experience in the specific field (all applicants have the required experience for the Advanced Level)
Background Information/Summary	<p>The EU’s strategy for sustainable growth, Europe 2020, puts innovation and green growth at the heart of its blueprint for competitiveness, leading to a completely new demand for environmental skills in the construction sector. However, training providers have not yet caught up with this new skills demand, creating an important skills gap in the current labour market, as highlighted in the “Green skills and environmental awareness in vocational education and training” report from CEDEFOP. Green skills and environmental awareness in vocational education and training, state that most learning providers do not yet include green skills in their learning strategy</p> <p>GSS–VET (Geothermal and Solar skills – Vocational education and training) project aims to design and deliver a demand-driven Vocational and education training in response of the targets set up by the EU Directive 2010/31/EU on the Energy Performance Buildings: all new buildings by 2020 to be nearly zero energy buildings.</p> <p>This training belongs to the Training of Trainees plan of the GSS_VET project carried out by the Bulgarian partners of the consortium. This plan and the training actions included have been globally conceived and implemented within the Pilot Training (WP5) project framework, being therefore in line with the objectives and general guidelines of this key GSS-VET process.</p> <p>The purpose of the training with trainees is the pilot application for global assessment and validation, and, based on this experience, it may be disseminated to other interested training providers, or give post-project recommendations related to its sustainability at national and European level and practical applications.</p>
Implementation	<p>All Bulgarian partners participated in the training activities. The organization of the training started with a round table for the presentation of the GSS-VET project. The round table was attended by 3 experts from the National Agency for Vocational Education and Training (NAVET) who provide very useful feedback and advices for the a better execution of the training activities. During the whole process of training activities implementation, the Chamber of Installation Specialists in Bulgaria was in touch with NAVET for the adaptation of the training and evaluation mechanisms according to the national regulation.</p> <p>These training activities were implemented following the curricula, teaching methods and training content developed in the frame of the GSS-VET project, slightly adapting them to the requirements of the national regulation if required. The selection of trainers and trainees was done following the requirements of the Professional Qualifications Standard elaborated by TUV AUSTRIA HELLAS for the GSS-VET project. The learner’s evaluation was conducted according to the examination process approved by NAVET. The examination mechanism is in accordance with the ISO/IEC 17024 requirements and it follows the ECVET</p>

recommendations. The Certification Scheme consists of two levels, the Basic and the Advanced Level, depending on the candidate's professional experience. In Bulgaria, all participants passed the Advanced Level, as they have relevant education and more than 2 years of experience.

Two different types of installers training were performed in Bulgaria:

- Installers Training of photovoltaic systems for electricians.
- Installers Training of solar thermal systems for plumbers.

INSTALLERS TRAINING OF PHOTOVOLTAIC SYSTEMS FOR ELECTRICIANS

It was conducted in three parts:

- theory in classroom
- self- training and
- practical part in companies members of CISB

The objective of the training course is to train engineers to acquire knowledge and skills required to install, maintain and inspect solar photovoltaic installations.

The training was conducted according to the Curriculum based on the syllabuses developed under GSS-VET Project. It included 40 academic hours covering all topics and an exhaustive presentation and demonstration of the e-learning platform. An attendance diary was kept during the training process where the attendance of the participants was recorded. 30 trainees attended the theoretical part of the PV installers training.

The training seminars were followed by a 10 hours self-training using the e-Learning Platform, or the training material distributed on USB memory stick.

The practical training was performed in four companies working in the field of photovoltaic installations and according to the requirements.

The training activities were followed by exams:

- Theory examinations: A written examination with 50 multiple choice questions randomly selected from the Examination Question Bank. Duration: 1hour. It was conducted by a trainer, having more than two years of experience in the sector.
- Online Examination: fill in a test in the learning platform.
- Practical examination: not performed as all participants were at advanced level.

Certification:

After reviewing the participants' data and written tests, the director of the Centre for Vocational Education of CISB awarded 30 participants with a certificate for professional training. They are recognised by NAVET (National Agency for Vocational Education and Training) and uploaded in NAVET data base. They are also valid for all EU countries.

The written tests, attendance diaries and curricula were also sent to NAVET as proofs of compliance with the National Legislation and uploaded in the database of the Agency for Sustainable Energy Development. To the participants who successfully passed also the test in the learning platform where issued certificates by TUV AUSTRIA. 17 installers of PV systems were awarded with such certificates.

TRAINING OF INSTALLERS OF SOLAR THERMAL SYSTEMS FOR ELECTRICIANS

It was conducted in three parts:

- theory in classroom
- self- training and
- practical part in companies member of CISB

	<p>The objective of the training is to train plumbers in low temperature solar thermal installations in order to acquire all the knowledge and competences needed to install and maintain them.</p> <p>The training was conducted according to the Curriculum based on the syllabuses developed under GSS-VET Project. It included 40 academic hours covering all topics and an exhaustive presentation and demonstration of the e-learning platform. The lectures were presented by trainers who passed the training of trainers under the GSS-VET project, in accordance according to their field of expertise.</p> <p>An attendance diary was kept during the training process where the attendance of the participants was recorded. 17 trainees attended the theoretical part of solar thermal systems installers training.</p> <p>The training seminars were followed by a 10 hours self-training using the e-Learning Platform, or the training materials that were distributed on USB memory stick.</p> <p>The practical training was performed in five companies working in the field of photovoltaic installations and according to the requirements.</p> <p>The training activities were followed by exams:</p> <ul style="list-style-type: none"> • Theory examination: a written examination with 50 multiple choice questions randomly selected from the Examination Question Bank. Duration: 1hour. It was conducted by a trainer, having more than two years of experience in the sector of RES systems. • Online examination: fill in a test in the learning platform. • Practical examination: not performed as all participants were at advanced level. <p>Certification:</p> <p>After reviewing the participants' data and written tests, the director of the Centre for Vocational Education of CISB awarded 17 participants with a certificate for professional training. They are recognised by NAVET and uploaded in NAVET data base. They are also valid for all EU countries. The written tests, attendance diaries and curricula were also sent to NAVET as proofs of compliance with the National Legislation and uploaded in the data base of the Agency for Sustainable Energy Development. 16 certificates for installers of solar thermal systems were issued. To the participants who successfully passed also the test in the learning platform where issued certificates by TUV AUSTRIA. 6 installers of solar thermal systems were awarded with such certificates.</p> <p>Additional trainees</p> <p>Additionally 8 experts used the online platform for self-preparation and passed successfully the test in the e-learning platform.</p>
<p>Challenges/Limitations Identified</p>	<p><i>Challenge:</i></p> <p>At application stage, the creation of only two curricula was planned (one for solar installations and another one for geothermal installation). However, during the discussions between experts, it became clear that a third separate curriculum specialized on photovoltaic field was needed.</p>

Outcomes	<p>The online component and the virtual learning environment is highly valued. According to the surveys carried out on participants, these modalities and resources should be further promoted in continuous vocational training (of installers, in this case) and adult training contexts at local and other levels, being the GSS-VET training framework a good practice to be taken into consideration.</p> <p>The training that participants and trainers have experienced also has received good marks, according to the surveys carried out on participants. This is relevant from the point of view of the validation of the GSS-VET training framework, which is the pilot training's general objective.</p> <p>Bulgarian participants of the Training of Trainees plan of the GSS-VET obtained a certificate for professional training recognised by NAVET (National Agency for Vocational Education and Training (NAVET) which is also valid for all EU countries.</p>
Benefits	<p>Development of an online learning environment.</p> <p>Flexibility: learning anywhere and anytime.</p> <p>Bulgarian certificate is recognized and valid in all UE countries.</p>
Lessons Learned /Recommendations	<ul style="list-style-type: none"> • The curriculum was developed through: <ul style="list-style-type: none"> ○ surveys, ○ mapping of the existing vocational training syllabuses, and ○ discussions with representatives of companies working in the field of RES on the needed skills and competences of the specialists. <p>This is important as the gap between the skills needed in the current labour market and the skills provided by the training centers is reduced.</p> • Use innovative training methods of ubiquitous learning: <ul style="list-style-type: none"> ○ Flipped classroom, ○ Self-training using the specially developed platform of the project, with personalized access to training content, quizzes, tests and games ○ Practical training in a real-life working environment ○ The training content should focus in the technical skills but also on transversal ones like entrepreneurship, interdisciplinary skills and ability to work effectively with people.
How it may be used/replicated within your or other organisations	<p>The purpose of the training with trainees is the pilot application of the training framework of the GSS-VET project, to assess it in its totality and validate it; and, based on this experience, to disseminate it to other interested training providers, or to elaborate post-project recommendations related to its sustainability at national and European level and practical applications. Several VET providers as universities, vocational schools and training centres expressed their interest in incorporating the training methodology, materials and platforms in their training activities.</p>
Comments/Additional information	<p><i>No additional comments</i></p>
References/Links	<p>https://www.eddie-erasmus.eu http://gss-vet.eu/</p>

IDENTIFY INNOVATIVE APPROACHES, METHODS, AND POLICIES FOR VOCATIONAL EDUCATION AND TRAINING (VET)

Scope: European, National, Local, or Organisational

Focus on: Real case studies where good practices were applied such as - work-based learning, student-centered approach, gamification, simulation, digital tools, collaborative approach and etc

Title: «PV and Storage Optimisation Tool» & «StoRES Living Lab»

Ecosystem: Energy and Battery Energy Storage

Organisation Name	<p>The tools were developed under the framework of the Interreg Med project with title «Promotion of Higher Penetration of Distributed PV through Storage for all» and acronym «StoRES» and were implemented in events and stakeholder trainings offered under the scope of the project as well as thereafter.</p> <p>The «StoRES» project was co-financed by the European Regional Development Fund and aimed to address the development of an optimal policy for the effective integration of Renewable Energy Sources and Energy Storage Systems. Its consortium consisted of 18 partners (both active and associates). The consortium consisted of the University of Cyprus (FOSS, project coordinator, Cyprus), Aristotle University of Thessaloniki (Greece), AREAL - Regional Energy and Environment Agency of Algarve (Portugal), SARGA - Government of Aragon (Spain), Municipality of Slovenska Bistrica (Slovenia), Regional Energy and Environment Agency in Rhone-Alpes (France), Ministry of Energy, Commerce, Industry and Tourism (Cyprus), Municipality of Ussaramanna (Italy), Electricity Authority of Cyprus/Distribution System Operator (Cyprus).</p>
Approach/Method/Policy Name	<p>Simulation-based education: The «PV and Storage Optimisation Tool» tool gives users the opportunity to find the optimal PV+Storage system sizing taking into consideration the appropriate policies using actual data from the domestic sector but in a simulation environment. Likewise, the «StoRES Living Lab» gives users the opportunity to perform tests and experiment with different parameters influencing energy storage using ‘real-life’ (actual) data (collected from pilot sites) but in a simulation environment.</p> <p>Student-centred approach: Participants to the training/events were shown the tools and emphasis was placed on the aspects of main interest for the respective stakeholders (e.g. authorities, customers, manufacturer, research institutes) to make it more meaningful to them and their occupation.</p>
Country and Year	<p>The «PV and Storage Optimisation Tool» (storestool.eu) and the «StoRES Living Lab» (stores-livinglab.eu) were developed in 2019 under the framework of the «StoRES» project.</p>

Target Group, Scope and Sector	<p>The tools were designed to be used by anyone (i.e. regardless of their level of knowledge on the topic):</p> <ul style="list-style-type: none"> • PV+Storage installers (incl. SMEs and other enterprises) • Prosumers • Authorities (Local/Regional/National public authority) • Education institutions (incl. research centres, training centres, schools) • Service providers • Business support organisations • General public etc. etc. <p>Scope of the tools:</p> <ul style="list-style-type: none"> • European: Tools developed under an EU-funded project, with partners from the Med region and may be used in any of the partner countries and beyond. • National: Tools used by anyone at national level, they are free and applicable in the participating counties. • Organisational: Tools used in training offered by the organisation.
Background Information/Summary	<p>The «PV and Storage Optimisation Tool» is an online tool to enable installers and/or prosumers to evaluate the economic viability of a PV+Storage system. The tool takes into consideration various parameters such as detailed load and production profiles, electricity costs, various supporting schemes, etc. The user enters various inputs: electrical consumption, solar irradiation, PV and battery size, and electricity costs. The tool calculates the Levelised Cost of Electricity, the Net Present Value and the Internal Rate of Return. The tool may be used to estimate the best PV+Storage system sizing from an economic point of view.</p> <p>The «StoRES Living Lab» provides an interactive web platform, which displays data collected from the project «StoRES» pilot sites (or any other pilot site provided that the data input is in the same format as that underpinning the tool) and allows users to experiment with different parameters that influence energy storage. Different pilot plants can be compared between each other and a parametric study is also included to assess the sizing of the PV and of the BESS. Under the parametric study feature, the user may modify the size of the PV capacity and/or the BESS size and observe how the performance rates are affected. For each profile, the following values are represented:</p> <ul style="list-style-type: none"> • PV production power • Load consumption power • Direct PV power use • Power charged/discharged in/from the battery • Power imported/exported from/to the grid • State-of-Charge percentage level
Implementation	<p>The tools were implemented in various workshops and events as well as dedicated stakeholder trainings at partner countries. For the dedicated stakeholder trainings, participants were given an overview of the «StoRES» project and thereafter the training focused on the topics of main interest for the categories of the stakeholder involved in the training. This was followed by</p>

	the demonstration / interactive session of the tool and thereafter a discussion on the lessons learned (e.g. new policies, impact on the network).
Challenges/Limitations Identified	Both tools have in-built real data from the «StoRES» consortium countries (i.e. Cyprus, France, Greece, Italy, Portugal, Slovenia, Spain). However, the «PV and Storage Optimisation Tool» may be used for other regions/countries, as the tool gives the opportunity to the user to upload sample average consumption profiles to be used in the calculations. Likewise, for the «StoRES Living Lab» project partners may upload new data of the existing plants or include new sites on the platform.
Outcomes	<p>The «PV and Storage Optimisation Tool» aims at calculating the optimal size of a hybrid PV+Storage system in terms of financial (Net Present Value of the investment). A financial analysis for a period of 20 years is performed, taking into consideration technical and financial parameters and various options of energy policies.</p> <p>The «StoRES Living Lab» platform presents actual data from pilot sites and allows users to experiment with different parameters which influence energy storage.</p> <p>Both tools are freely available and may be used by anyone (i.e. professional and non-professional users).</p>
Benefits	Participants to the «StoRES» stakeholders training received a «Certificate of Attendance» for attending a 2-hour training on Battery Energy Storage. The Certificate had the logos of the institutions involved therefore were recognized in their respective countries.
Lessons Learned /Recommendations	The tools should be updated to include any upcoming technologies, new policies etc. within participating countries and across other countries.
How it may be used/replicated within your or other organisations	<p>The tools have already been incorporated in the practical part of the Vocational Education and Training (VET) course entitled «Energy Storage: Diverse role in the modern Electricity Network» offered by the Photovoltaic Technology Lab (PV-Lab), FOSS, Research Centre for Sustainable Energy (FOSS), University of Cyprus (UCY). The course is subsidized by the Human Resource Development Authority of Cyprus (HRDA). Participants to the course receive a certificate from the UCY having the encryption that the course was subsidized by HRDA, which is well recognized in Cyprus (and overseas).</p> <p>It is noted that the «PV and Storage Optimisation Tool» has been used by companies for sizing of PV+BES systems.</p> <p>The tools may be adopted for training purposes on PV+Storage in VETs to assist trainees to in other countries and/or may be replicated using other RES with storage (e.g. wind energy).</p>
Comments/Additional information	The tools which may be used to optimally design PVs+Storage before installation (in terms of financial, policies, technical) are easily accessible to

	everyone and may contribute to the digital and green transition of VETs in the field.
References/Links	<p><u>PV and Storage Optimisation Tool</u></p> <ul style="list-style-type: none"> ➤ Tool: https://storestool.eu/#/StoRES-Tool ➤ StoRES respective deliverable: Deliverable 3.8.1 (Online Optimization Tool) <p><u>StoRES Living Lab</u></p> <ul style="list-style-type: none"> ➤ Tool: https://storestool.eu/#/StoRES-Tool ➤ StoRES respective deliverable: Deliverable 2.3.9 (Living Lab) <p><u>General</u></p> <ul style="list-style-type: none"> ➤ StoRES project website: https://stores.interreg-med.eu/ ➤ VET courses offered by PV-Lab, FOSS: www.pvtechnology.ucy.ac.cy/ and www.foss.ucy.ac.cy/

IDENTIFY INNOVATIVE APPROACHES, METHODS, AND POLICIES FOR VOCATIONAL EDUCATION AND TRAINING (VET)

Scope: European, National, Local, or Organisational

Focus on: Real case studies where good practices were applied such as - work-based learning, student-centered approach, gamification, simulation, digital tools, collaborative approach and etc

Title: «Developing energy-efficient competencies of tomorrow’s building professionals, the «MEnS» case-study »

Ecosystem: Energy

Organisation Name	Under the scope of the EU-funded project with title «Meeting of Energy Professional Skills» and acronym «MEnS» specialised material and training were developed to educate building professionals on how to retrofit the housing stock to meet nearly-zero energy building standards (NZEB). The consortium comprised 13 partners from 11 countries: EnerGia-Da S.r.l. (Italy – Coordinator), Knowledge Transfer Network Ltd (United Kingdom), Aristotle University of Thessaloniki (Greece), Brunel University London (United Kingdom), University of Cyprus (Cyprus), Technical University of Cluj-Napoca (Romania), Technological University Dublin (Ireland), Energy Consulting Network AS (Denmark), Radio-Television Belge de la Communaute Francasie (Belgium), Cyril and Methodius University Skopije (North Macedonia), Université Libre de Bruxelles (Belgium), University of Kassel (Germany) and Universitat Politècnica de València (Spain).
Approach/Method/Policy Name	<p><u>Modularity and flexibility of system/training:</u> Comprises of various units that could be taught for training on their own as stand-alone modules or may be assembled together into developing short courses or even a Master course.</p> <p><u>Micro-credentials:</u> Course developed were EQF Level 7 of 10 ECTS accreditation. Therefore, the course: (i) had a value in itself (EQF Level 7), (ii) could contribute to a larger credential or degree as the course developed was</p>

	accredited by the participating European Universities (10 ECTS), and (3) could be part of a portfolio that demonstrates individuals' proof of learning as participants received a certificate of attendance.
Country and Year	2015-2017 under the scope of the H2020 project with acronym «MEnS».
Target Group, Scope and Sector	<ul style="list-style-type: none"> • Building professionals (such as architects and engineers) engaged in the retrofitting of the domestic sector, in order to create and operate more energy efficient buildings that are in line with NZEB standards. • The project target was to increase the knowledge and skills of at least 1,800 building professionals in NZEB design and construction, out of which 50% would be female or unemployed professionals in the Built Environment sector to enhance their participation. <p>Scope of the training material:</p> <ul style="list-style-type: none"> • European: Developed by an EU consortium to assist in the uptake of NZEBs. • National: NZEB material tailored to the needs of the participating countries • Organisational: Implemented after the project by the organisations voluntarily.
Background Information/Summary	<p>In 2011 the EU launched the «BUILD UP Skills Initiative», with the aim to equip the next generation of construction sector workers at levels (such as on-site workers, design professionals, senior management) with the required skills and knowledge to ensure buildings (new and renovated) meet the stringent energy-efficiency requirements. Eleven EU-funded projects contributed to driving forward the «BUILD UP Skills Initiative», one of which is the «MEnS» project.</p> <p>The «MEnS» aimed to enhance the NZEB skills of building professional through a series of accredited training activities developed by 10 universities and 3 market players. To this end, the training activities of the project fell under 3 pillars:</p> <ul style="list-style-type: none"> (i) EQF Level 7: To create and implement a new educational and training program for building professionals in 10 countries, under the European Qualifications Framework provisions and based on Level 7 desired and common learning outcomes. The programmes had a common structure and learning outcomes and courses were accredited with a total of 10 ECTS by all institutions. (ii) Front Meeting of Skills: Training focusing on real case studies. (iii) E-learning platform: Interactive space portal promoting distant learning and encouraging key stakeholder debate. <p>The aim of developing the EQF Level 7 educational program was to train professionals with NZEB strategies and technologies to accelerate the adaptation of the European's Energy Performance of Building Directive (which included the obligations for new buildings constructed after the 31st December 2020 to be NZEB).</p>
Implementation	This training package was designed based on findings from market analysis, which identified construction industry needs and the main gaps existing

	<p>regarding NZEB at national level. The material was specific to each University and also took into consideration the expertise of each partner.</p> <p>Although the educational programmes developed followed a common structure (whilst having some flexibility to accommodate for national particularities), each university developed its own Educational and Training Course Program. Firstly, the objective of the course was identified based on market analysis, and then prepared the course outline, the Educational and Training program, learning outcomes, national specifics and adaptations, delivery method and assessment method. The aim was to address topics that would be of particular interest to building professionals practicing in the country it would be applied, in order for participants to be able to relate better to the training course and be able to apply information more readily and effectively.</p> <p>UCY for example focused on Building Integrated PV (BIPV) in the NZEB context as in Cyprus, as well as the for most of the Med region, due to the high solar irradiance, PVs constitute an ‘easy’ way to contribute to achieving NZEBs. Therefore, material developed at UCY had a particular focus on the prospects of integrating PV technology in buildings.</p> <p>There were 3 editions of the Educational Program, in order to improved it based on feedback received from trainers and trainees.</p>
Challenges/Limitations Identified	<p>It is important not only to develop tailored material but also to communicate the importance and benefits of the material developed in the professional careers of the participants. For example, from the surveys, it was suggested that in some countries, participants would not have enrolled if the trainings were not offered free of charge and were not certain to what extend the educational program would help them in their professional career as at the time some of the countries did not have a national transposition for adopting the EU Directive.</p>
Outcomes	<ul style="list-style-type: none"> • Developed accredited training courses on NZEB. • Provided 30 trainings courses to over 200 professionals under the scope of the project.
Benefits	<ul style="list-style-type: none"> • Based on survey feedback on the courses the interdisciplinary approach to NZEB was well-perceived by the participants. • Courses developed were in line (same ECTS, had similar structure etc) however they were specific to the national needs and took into consideration the expertise of each partner.
Lessons Learned /Recommendations	<p>From the design and implementation of the courses, it is evident that it is equally important to design courses that meet the needs of industry but to communicate as well the importance of the course offered to the participants.</p>
How it may be used/replicated within your or other organisations	<ul style="list-style-type: none"> • Some of the university partners continued to provide training on NZEB as part of their curriculum and training for professionals. • For UCY, after the project completion: <ol style="list-style-type: none"> (1) An NZEB module was incorporated in a Master course offered by the Department of Electrical and Computer Engineering.

	<p>(2) A vocational training course on NZEB (subsidized by HRDA) was designed and offered by PV-Lab, FOSS: « Fundamentals of Nearly Zero Energy Buildings».</p> <p>(3) A vocational training course on BIPV (subsidized by HRDA) was designed and offered by PV-Lab, FOSS: « Fundamentals of Building Integrated Photovoltaics».</p>
Comments/Additional information	Courses should be constantly updated to meet the current national and EU regulations, market needs as well as to be in line with the latest technological developments.
References/Links	<p>BUILD UP Skills Initiative: http://www.buildup.eu/en/skills</p> <p>MEnS course information: https://cordis.europa.eu/project/id/649773</p>
IDENTIFY INNOVATIVE APPROACHES, METHODS, AND POLICIES FOR VOCATIONAL EDUCATION AND TRAINING (VET)	
<p>Scope: European, National, Local, or Organisational</p> <p>Focus on: Real case studies where good practices were applied such as - work-based learning, student-centered approach, gamification, simulation, digital tools, collaborative approach and etc</p>	
<p>Title: «PV System Designer and Installer»</p> <p>Ecosystem: Energy</p>	
Organisation Name	The PV-Lab, FOSS, UCY.
Approach/Method/Policy Name	<p>The «PV System Designer and Installer» is a vocational education course offered by PV-Lab, FOSS and has a theoretical and a practical section. Part of the practical training:</p> <p>Work-based learning: The «Training Set-Up for Installation of PVs » was built at the PV-Lab. It imitates a typical roof of a household in Cyprus ready for PVs to be installed (i.e. has an inclination, roof tiles, PV mounting rails etc). PV training installers have an exposure on the installation of PVs using ‘real life’ material (i.e. actual PVs, experience working at an inclination, using safety protection (fall restrain) etc) but in an educational setting.</p> <p>Collaborative approach: All trainees get the opportunity to install PVs, collect data from the installed PVs on the «Training Set-Up for Installation of PVs». They get the opportunity to work in small groups, like they would do in a real-life environment for installing PVs.</p>
Country and Year	PV training has been provided for over 5 years at the PV-Lab, FOSS through various courses (bespoke and as part of vocational training).
Target Group, Scope and Sector	<p>Main group includes:</p> <ul style="list-style-type: none"> • Engineers (primarily electrical engineers) • Electricians

	<ul style="list-style-type: none"> Managing personnel in companies related to PVs. <p><u>Scope of the training material:</u></p> <ul style="list-style-type: none"> National: Course offered to anyone interested at local level (subsidized by HRDA) to equip the workforce with PV design and installation courses. It is noted that there were requested from MENA region for bespoke training on designing and installing PVs. Organisational: Course designed and implemented voluntarily by the organisation.
Background Information/Summary	<p>The PV-Lab, FOSS, committed to serve the industry whilst contributing to the clean energy transition, has developed the VET course «PV System Designer and Installer» to equip organizations and their personnel with the relevant skills required for the design and installation of PV systems. In order to address the skills gap, the course offers a theoretical part and a practical (hands-on approach) part.</p> <p>The course is in line with «The Promotion and Encouragement of the Use of Renewable Energy Sources (Certification of Installers of Small-Scale Renewable Energy Systems) Regulations» (RAA 374/2015). The PV-Lab, FOSS is certified by the Ministry of Energy, Commerce and Industry (MECI) (energy Service) to offer this course and therefore upon its successful completion participants may apply to be registered as an installer of small-scale renewable energy systems which is valid for 6 years.</p> <p>It is expected that VET courses such as the one offered by the PV-Lab, will be in line with the EU Solar Energy Strategy adopted by the Commission as part of the REPowerEU plan, which aims to accelerate the deployment of solar energy technologies in the EU. Specifically, under the European Solar Rooftops Initiative, it aims to address the installation of solar energy on the (underutilised) rooftops.</p>
Implementation	<p>The vocational course has been implemented successfully twice a year for over 5 years. Participants are given the opportunity to undertake an exam at the end of the course and upon successful completion they may register in the Ministry of Energy, Commerce and Industry (MECI) registry for certified small-scale renewable energy systems.</p>
Challenges/Limitations Identified	<p>The technology and materials used (e.g. inverter, PVs) should be in line with the latest state-of-the-art practices.</p>
Outcomes	<p>Through the practical part of the course the trainees get exposure on all aspects that he may encounter as an installer in ‘real-world’ scenario: troubleshooting, demonstrate appropriate installation, collect data to ensure correct operation, safety for installation.</p>
Benefits	<p>The trainees have the opportunity to apply the knowledge they acquire through the theoretical part of the course to enhance further their knowledge and skills through the practical part and prepare them for installations in the ‘real’ world.</p> <p>At the end of the course (and subject to successful completion) participants receive a certificate from the UCY, which has the MECI logo and mentions the</p>

	<p>course was subsidized by HRDA. All organisations are well recognized in Cyprus (and overseas), therefore this equips the participants with skills to make the employable not just in Cyprus but overseas as well in the field. Further participants may apply to be registered as an installer of small-scale renewable energy systems in the registry of MECI.</p>
Lessons Learned /Recommendations	<p>The course equips trainees with practical knowledge to ensure the quality assurance at all stages of the PV design, installation, operation and maintenance.</p>
How it may be used/replicated within your or other organisations	<p>The course aims to bridge the gap between education and practice and equip trainees with the anticipated skills and techniques required to conduct the installation of PVs in a safe manner. As the technology progresses, more advanced technologies, inverters etc may be used.</p>
Comments/Additional information	
References/Links	<div style="text-align: center;">  </div> <p><u>Course information:</u> FOSS, UCY website: www.foss.ucy.ac.cy/ PV Technology, UCY website: www.pvtechnology.ucy.ac.cy/</p>
IDENTIFY INNOVATIVE APPROACHES, METHODS, AND POLICIES FOR VOCATIONAL EDUCATION AND TRAINING (VET)	
<p>Scope: European, National, Local, or Organisational</p> <p>Focus on: Real case studies where good practices were applied such as - work-based learning, student-centered approach, gamification, simulation, digital tools, collaborative approach and etc</p>	
<p>Title: «Energy Storage: Diverse role in the modern Electricity Network»</p> <p>Ecosystem: Energy and Battery Energy Storage</p>	
Organisation Name	<p>The PV-Lab, FOSS, UCY.</p>

Approach/Method/Policy Name	<p>The «Energy Storage: Diverse role in the modern Electricity Network» is a vocational course offered by PV-Lab, FOSS and has a theoretical and a practical section. Part of the practical training methods include:</p> <p>Digital tool: Uses digital tools (the «StoRES Online Tools» referred to in this report namely, the «PV and Storage Optimisation Tool» and the «StoRES Living Lab») to enable the trainees to acquire skills (digital and technical) to optimally design PV+BES systems.</p> <p>Work-based learning: Has a typical domestic size BESS system («Educational Battery Energy Storage System») installed at the PV-Lab under the «Training Set-Up for Installation of PVs» which connects with the PVs. Its purpose is to imitate a typical domestic PV+BESS setup but is used for educational/training purpose. Participants to the course, have the opportunity to install the BESS and connect it with the inverter, PVs in an educational environment therefore they identify the equipment, set-up / installation, operation modes, conduct verification, safety measures for installation/checks etc.</p> <p>Collaborative approach: All trainees get the opportunity to install / connect the «Educational Battery Energy Storage System». They get to work in groups, like they would do in real life situations.</p>
Country and Year	<p>The «StoRES Online Tools» are readily available on any computer with internet connection. The «Educational Battery Energy Storage System» is located on the premises of the PV-Lab, FOSS and has been installed and is accessible for training purposes since 2022. The course was implemented for the first time in 2022.</p>
Target Group, Scope and Sector	<p>Main group is for personnel that are engaged with PV and/or BESS installation/testing/inspections. These may include:</p> <ul style="list-style-type: none"> • Engineers (primarily electrical engineers). • Practicing electricians. • Managing personnel in companies related to PVs and/or Storage.
Background Information/Summary	<p>The aforementioned tools and methods are part of the «Battery Energy Storage System Installation: Practical Aspects» used in the practical part of the vocational training course entitled «Energy Storage: Diverse role in the modern Electricity Network» offered by the PV-Lab, FOSS, UCY and subsidized by the HRDA. The course focuses on BESS in the domestic sector and trainees get to experience through hand-on approach the key requirement for the appropriate install of a BESS. The aim is to be in line with the new upcoming regulations for Energy Storage.</p> <p>Energy Storage is expected to have a significant uptake with new regulations and recommendations. For example, the EU Directive 2019/944 which makes reference to energy storage and energy communities and there are «Commission Recommendations on Energy Storage – Underpinning a decarbonised and secure EU energy system» (2023/C 103/01).</p>
Implementation	<p>The course has been implemented successfully for the first time in 2022. The course commences with a theoretical part which includes an overview of different battery systems, installation procedures. The trainees then get to</p>

	experience through the practical part the actual connection, troubleshooting, safety measures, tools required etc.
Challenges/Limitations Identified	In Cyprus we are still in process of incorporating storage into the grid codes and respective policy framework subsidies. Therefore, the online tools may have to be updated accordingly and the practical installation procedures and checks may have to be updated to be in line with the new policies and recommendations.
Outcomes	Through the theoretical part trainees acquire knowledge on the topic and get to apply them through the practical part. Trainees get exposure on all aspects that he may encounter as an installer in ‘real-world’ scenario through the practical part: troubleshooting; demonstrate appropriate installation, collect data to ensure correct operation; safety for installation.
Benefits	Addresses the needs of the market (in particular in Cyprus) for new qualifications/skills to assist in the uptake of energy storage and enhance the PV penetration further.
Lessons Learned /Recommendations	The course equips trainees with the theoretical but most importantly the practical knowledge and skills to ensure the quality assurance at all stages of BESS sizing, installation, grid-connection, operation and maintenance.
How it may be used/replicated within your or other organisations	The course aims to bridge the gap between education and practice and equip trainees with the anticipated skills and techniques required to conduct the installation of BESS (and in conjunction with PVs) in a safe manner. As the technology progresses, more advanced technologies, inverters etc may be used.
Comments/Additional information	<i>No additional comments</i>
References/Links	 <p><u>Course information:</u> FOSS, UCY website: www.foss.ucy.ac.cy/ PV Technology, UCY website: www.pvtechnology.ucy.ac.cy/</p>

IDENTIFY INNOVATIVE APPROACHES, METHODS, AND POLICIES FOR VOCATIONAL EDUCATION AND TRAINING (VET)

Scope: European

Focus on: Real practical experience where good practices were applied such as collaborative approach between education centres, a technological centre and company

Ecosystem: maritime

Organisation Name	CENTRO TECNOLÓGICO DEL MAR - FUNDACIÓN CETMAR in collaboration with Marine Instruments Ltd. https://cetmar.org/ https://www.marineinstruments.es
Approach/Method/Policy Name	Maritime on the Loop of Ocean Literacy (MOL ²) – Pilot Experience of the MATES blueprint project https://www.projectmates.eu/pilotexperience/mol2
Country and Year	Spain – Galicia 2020
Target Group, Scope and Sector	Target beneficiaries include students, teachers, trainers, skilled workers and those who have recently joined the workforce. Results from these Pilot Experiences are particularly relevant for the following stakeholder groups: <ul style="list-style-type: none"> • Local Government in charge of education • Industry • Research and Development Centres/Universities • Vocational and Educational Training (VET) Centres • Secondary Schools SCOPE: European, tested in Spain and Italy SECTOR: Maritime technologies (shipbuilding, renewable energy)
Background Information/Summary	MOL ² is a Pilot Experience implemented during the MATES project, an EC-funded, ERASMUS+ project, developed from 2018-2022, whose objective was to develop a skills strategy that addresses the main drivers of change in the maritime industries, in particular shipbuilding and offshore renewable energy. Pilot Experiences are vital components of the strategic design of the project. They consist of a series of activities that fall in line with the priority areas needed to support training and development of the shipbuilding and offshore renewable energy industries. Transitioning to a Blue Economy is a key priority for the European Union ¹ . However, many EU citizens and in particular younger groups, still do not know very much about fundamental aspects of the ocean nor about the many professional opportunities associated with the Blue Economy ² . In this context, the term Ocean Literacy has a good deal of importance: it refers to individuals' understanding of the ocean's influence on them, and their own influence on the ocean. This concept, originally coined in the United States only in 2001, was not addressed by European projects until 2011 ³ . An ocean-literate person understands the importance of the ocean to humankind; is able to communicate about the ocean in a meaningful way; and perhaps most important of all, can make informed and responsible decisions

¹ Developing a sustainable blue economy in the European Union, European Commission - ec.europa.eu/commission/presscorner/detail/en/ip_21_2341

² R. M. Fernández Otero, G. A. Bayliss-Brown, and M. Papatthanassiou, Ocean Literacy and Knowledge Transfer Synergies in Support of a Sustainable Blue Economy, *Front. Mar. Sci.*, vol. 0, 2019, DOI: 10.3389/fmars.2019.00646

³ Ocean Literacy Europe, May 14, 2015. oceanliteracy.eu

	<p>regarding the ocean and its resources⁴. Thus, developing Ocean Literacy knowledge is a vital way to help citizens to appreciate the ocean’s environmental importance, as well as our relationship with the ocean, and how the ocean is adversely affected by negative, man-made impacts.</p> <p>Non-formal marine science education at primary school has proved to be a successful way of increasing children’s knowledge about Ocean Literacy⁵. Within this context, there is evidence that directly involving young people in activities linked to the maritime sector and encouraging them to be good stewards of the marine environment will help them, not only to develop their Ocean Literacy skills but will also raise awareness and provide knowledge on blue careers.</p> <p>Whilst the value of experiential learning in an Ocean Literacy context has not been explicitly assessed to date, such forms of learning and connecting are known to improve knowledge and skills, and to facilitate opportunities for young people to develop positive connections and attitudes towards ocean environments^{6, 7}.</p>
<p>Implementation</p>	<p>The purpose of the MOL2 (Maritime on the Loop of Ocean Literacy) Pilot Experience was to improve young peoples’ Ocean Literacy by increasing their understanding and awareness of the marine environment and related industries. The initiative promoted youth involvement in marine protection by making them reflect on the best ways to reduce their environmental impact in the ocean and by providing tools to help them to make informed and responsible decisions regarding the ocean and its resources.</p> <p>The main objective of MOL2 was therefore to develop educational and training methods focused on real industry-relevant skills, which would be suitable for younger audiences.</p> <p>Specific objectives of MOL2 were to:</p> <ul style="list-style-type: none"> ☑ Introduce marine industries and related employment opportunities to teenagers. ☑ Provide short courses on maritime technologies to students, while encouraging industry involvement in the training programmes. ☑ Promote careers for women in STEAM (Science, Technology Engineering, Arts and Maths). <p>The initiative, conducted in two quite separate locations: Galicia (Spain) and Trieste (Italy), piloted two ways of approaching secondary school students and teachers to promote Ocean Literacy and the technologies and skills linked to the maritime sector:</p> <p>In Spain, technical workshops were conducted as part of a larger competitive raft-racing event, the Regata Solar⁸: an annual raft building competition based in Galicia, Spain, organised by Marine Instruments Ltd⁹, a maritime technical company that develops and manufactures electronic equipment. Teams entering the regatta have to build a radio-controlled electric vehicle powered only by solar energy. Teams develop their entries throughout the academic year and the competition takes place at the end of June. There are three prizes</p>

⁴ Cava, F., Schoedinger, S., Strang, C., & Tuddenham, P. (2005). Science content and standards for ocean literacy: A report on ocean literacy. Retrieved March, 25, 2015

⁵ M. Mokos, G. Realdon, y I. Zubak Čížmek, How to Increase Ocean Literacy for Future Ocean Sustainability? The Influence of Non-Formal Marine Science Education, Sustainability, vol. 12, nº 24, p. 10647, 2020

⁶ K. Dubickas y A. Ilich, Becoming an ocean advocate through experiential learning, Oceanography, vol. 30, nº 4, pp. 10-11, 2017

⁷ R. Kelly et al., Connecting to the oceans: supporting ocean literacy and public engagement, Rev. Fish Biol. Fish., pp. 1- 21, 2021

⁸ <https://www.regatasolar.org/>

⁹ <https://www.marineinstruments.es/>

	<p>based on the efficiency, performance and design of the raft. The winning team receives a 3D printer for their school.</p> <p>The CETMAR team conducted six workshops with regatta participants covering topics such as management of priorities, CAD and 3D printing, boatbuilding with polyester, wood and bamboo, as well as electronics, remote control and telemetry.</p> <p>Meanwhile, in Italy, industry partners conducted classroom visits to engage students with practical examples of some of the professional opportunities available in maritime careers. This activity aimed to engage final year high school students with the digital technologies used in the shipbuilding and maritime sectors. The workshop covered an introduction to Ocean Literacy and an overview of 3D scanning and took place over two consecutive days, in three-hour sessions for two classrooms of about 25 students each. Knowledge of 3D scanning is a skill in high demand in the job market. Therefore, the MOL² activities made a significant contribution to aligning students' skills with industry demands.</p>
<p>Challenges/Limitations Identified</p>	<p>The regatta provides a good opportunity to challenge students' skills. However, success is largely dependent on the level of commitment and engagement of their respective Technology teachers. Technical support to the teams is limited.</p> <p>Due to COVID-19 restrictions, both the 2020 and 2021 Regata Solar competitions were cancelled.</p>
<p>Outcomes</p>	<ol style="list-style-type: none"> Valuable training materials that can be adapted and applied in other contexts: <ul style="list-style-type: none"> Six video tutorials addressing capacity building to develop engineering projects in the boatbuilding area: <ul style="list-style-type: none"> - MOL2 Training: Priority Management - MOL2 Training: Free CAD and 3D printing - MOL2 Training: Polyester Modelling - MOL2 Training: Wood Gluing - MOL2 Training: Uses of Bamboo - MOL2 Training: Electronics and Telemetry Slideshow about Ocean Literacy and a guideline for companies to contact education centres¹⁰ Ocean Literacy and the Maritime Industry of Tomorrow Protocol for replicating the industry-led talks in secondary schools The Regata Solar Terms of Reference (TOR) for the design award were reviewed in view. These now take into consideration not only the aesthetic design of the rafts as in previous competitions, but also the technologies and a circular economy approach to be used in the design and the building process. The TOR also took into consideration the materials used, waste management, or the carbon footprint reduction of each project, in line with the sustainable development goals. The training had been useful for improving the skills needed for the competition, and that these skills can also be applied in other contexts. Moreover, participants stated that they improved their Ocean Literacy knowledge Development of cross-border links (e.g Italy and Slovenia) within the framework of the Pilot Experience. Translation of the Pilot Experience's

¹⁰ <https://www.projectmates.eu/pilotexperience/mol2/>

	materials, videos, curriculum into other languages (e.g English, Slovenian).
Benefits	<ul style="list-style-type: none"> • A competition model is an opportunity to teach STEAM subjects in a fun and informal way, and for participants to gain soft skills, such as leadership and team working. • Skills development in the areas of climate change, sustainability, technology and digital competences. This kind of learning experience also helps to develop interpersonal and transversal skills. • This project-based extra-curricular activity encouraged students to take an interest in technology and renewable energy at the same time as improving their awareness and concern for the marine environment. • Running or sponsoring competitions is a good marketing strategy for companies, allowing them to gain more visibility among a wide audience, and attract younger talent. • These competitions could serve different purposes such as to create linkages between schools, VET centres and industry; enhancing relationships between teachers and students; or to develop networking opportunities and pathways for student graduates into marine related careers, ensuring alignment of the training offer and the skills demand.
Lessons Learned /Recommendations	<ol style="list-style-type: none"> 1. Engage with stakeholders: Hosting the Spanish workshops in collaboration with an existing, informal event (Regata Solar) helped to reach new audiences. 2. Work with industry collaborators: To develop the workshop materials and ensure their relevance to industry, the MOL2 teams engaged with five external industrial contributors (three in Galicia, and two in Trieste). 3. Take a flexible approach: The undoubted success of these two Pilot Experience exemplars clearly shows that similar content can be presented in different formal and informal education settings. 4. Open the workshops to teachers: They can provide a multiplier effect by gaining an experience that can be passed on to students year after year. 5. Record the workshops and deliver them in a video format: This enables organisers to reach more participants. In Spain, the Regata Solar organisers received renewed interest in replicating the competition at national and international levels thanks to the MOL2 training tutorials that were shared on YouTube.
How it may be used/replicated within your or other organisations	<p>Future editions of the Regata SOLAR will use the training materials and ToR developed</p> <p>The MOL² Pilot Experience created a framework which enables many groups in different geographic locations to design similar activities.</p> <p><u>Local Government in charge of education:</u> Encourage secondary and higher education centres to engage in informal education opportunities which can help students to learn and think outside of the box. Facilitate and promote these activities and lobby local companies to develop educational events.</p> <p><u>Industry, R&D centres/ Universities, VET Centres, Secondary schools:</u> The results of this Pilot Experience can guide and facilitate the involvement of interested stakeholders in the organisation of competitive events, calls for prizes or other types of non-formal educational events. All schools where industry-led talks were offered were interested in their implementation, and further interest has been expressed in Slovenia and Croatia.</p> <p>Even though the target audience of this Pilot Experience was secondary school students and teachers, it attracted interest from the University and</p>

	other type of education centres (two media labs: AmigusLab14 requested to follow the training when possible, and FablabMallorca15 showed interest in having a second round of the Regata Solar in Mallorca. Interest in the initiative also came from South America, where La Fundación Educativa Tecnológica Bilingüe (FUNDETEB) organised the first Regata Solar in Colombia).
Comments/Additional information	<i>No additional comments</i>
References/Links	https://www.projectmates.eu/pilot-experiences/ https://www.projectmates.eu/pilotexperience/mol2/

IDENTIFY INNOVATIVE APPROACHES, METHODS, AND POLICIES FOR VOCATIONAL EDUCATION AND TRAINING (VET)

<p>Scope: European Focus on: Real practical experience where good practices were applied such as collaborative approach between education centres, a technological centre and company Ecosystem: maritime</p>	
Organisation Name	CENTRO TECNOLÓGICO DEL MAR - FUNDACIÓN CETMAR https://cetmar.org/
Approach/Method/Policy Name	Green Move – Pilot Experience of the MATES blueprint project project https://www.projectmates.eu/pilotexperience/green-move/
Country and Year	Spain 2020-2021
Target Group, Scope and Sector	<p>Target beneficiaries include students and teachers from both Vocational Education and Training and University, and workers from companies addressing shipbuilding or offshore renewable energies.</p> <p>Results from this Pilot Experience are particularly relevant for the following stakeholder groups:</p> <ul style="list-style-type: none"> • Local Government in charge of education • Industry (technical staff from companies, experts from sectorial networks, entrepreneurs) • Research and Development Centres/Universities Centres (researchers, students & teachers) • Vocational and Educational Training (VET) Centres (students and teachers) • Life-Long Learning providers • Trade Unions <p>SCOPE: European SECTOR: Maritime technologies (shipbuilding, offshore renewable energy)</p>
Background Information/Summary	<p>Green Move is a Pilot Experience implemented during the MATES project, an EC-funded, ERASMUS+ project, developed from 2018-2022, whose objective was to develop a skills strategy that addresses the main drivers of change in the maritime industries, in particular shipbuilding and offshore renewable energy. Pilot Experiences are vital components of the strategic design of the project. They consist of a series of activities that fall in line with the priority areas needed to support training and development of the shipbuilding and offshore renewable energy industries.</p> <p>Mobility of workers and trainees is a crucial factor for Europe's welfare and economy. Learning mobility advances the personal and professional development of students and workers enhancing their employability through the acquisition of new skills and competences. Knowledge, language, intercultural</p>

dialogue and a better understanding of other educational systems were also important elements of the 'European Credit System for Vocational Education and Training' (ECVET)¹¹, which underpinned the importance of supporting mobility in two binding documents for the partners on the sending and hosting sides as well as for the learners – the Memorandum of Understanding (MoU) and the Learning Agreement (LA).

Green Move Experiences aimed to adapt mobility programmes to the needs of educational centres and their associated industry. The purpose is to break down barriers to allow different profiles to work together for the development of clear products resulting from the mobility programmes. Therefore, all visits, conferences and workshops topics were selected for a more efficient and lower CO2 emission in the shipbuilding and ORE industries, tackling climate change impact in agreement with the Green New Deal for Europe.

Implementation

The aim of the Green Move Experience is to promote the mobility (including exchanges and technical visits) of students and workers in an attempt to enable the use green technologies, whether developed locally, nationally or transnationally. The purpose was to find green solutions for the main Lines of Actions identified for the Shipbuilding (SB) and Offshore Renewable Energy (ORE) industries by means of the interaction of theoretically-based experts (designers, engineers) with more manually skilled groups (blue collar workers, VET & LLL students, etc.).

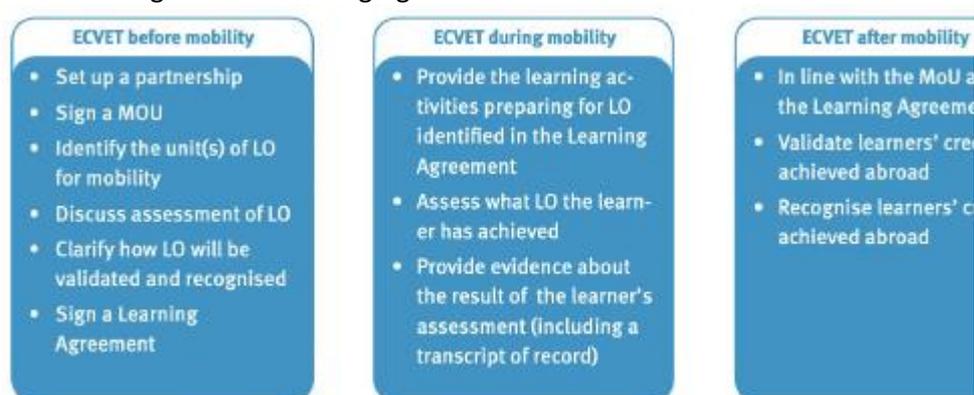
This Pilot Experience (PE) also focused on transversal skills that are commonly acquired in day-to-day activities.

The main objective of the Green Move was therefore to develop recommendations as to how to carry out mobility programmes focusing on the vision of the centre/company undertaking this activity.

Specific objectives of Green Move were to:

- Introduce marine industries and related employment opportunities to teenagers.
- Provide short courses on maritime technologies to students, while encouraging industry involvement in the training programmes.
- Promote careers for women in STEAM (Science, Technology Engineering, Arts and Maths).

The type of mobility chosen was inspired by and closely followed the successful aspects of ECVET methodology, based on the ECVET Memorandum of Understanding and the Learning Agreement.



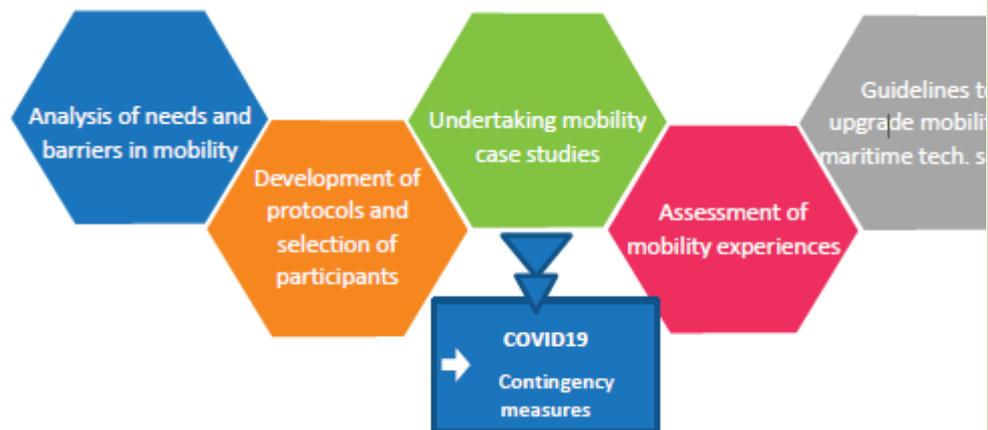
Legend: LO: Learning Outcomes; MoU: Memorandum of Understanding

¹¹ <http://eu-mobility.eu/documents/>

These, used as a means of promoting green technologies in the maritime sector, are suitable instruments to meet the needs of those organizations with the flexibility to organize the funding for the type of mobility most appropriate to the specific green Line of Action.

The Green Move Experience provides different types of adaptable and flexible mobilities to a wide range of participants from education centres and companies, bringing together different education levels and profiles. Sound information and knowledge have been exchanged as to which technologies are available in order to reduce the environmental impact of the shipbuilding industry, maritime transport and offshore operations.

Because this PE was initially planned as a mobility programme covering 14 different activities, visits and trips, we started off by analysing both the needs as well as the barriers to mobility, and developing the protocols required to select the participants and mobility cases. Just as we were about to start the exchanges, most of these planned as in-person, the Covid-19 crisis hit Europe. Since all movement was either banned or restricted, we had to develop more virtual mobility exchanges to overcome this new challenge.



Challenges/Limitations Identified Travelling restrictions as a consequence of the CoVid-19 pandemic have modified the mobility paradigms, especially technical school visits and internships. In 2020 all vocational knowledge exchange took place online. Remote activities are valued less than face-to-face ones, since its official recognition is difficult. In addition, short-time exchange events are not usually officially recognised. Solutions: Blended mobility programmes with more flexible allocation of funds can significantly expand the scope of the activities both in time and distance and allow exchanges with a greater number of students and workers. Additionally the model of blended mobility proposed is easily transferred. Certificates should always be provided in any kind of educational event. In fact, the new EUROPASS facilitates the recognition of these kinds of activities.

Outcomes The main results of this Pilot Experience are:

- a [Guideline for mobilities](#) addressed to the maritime sector: to upgrade mobility experiences and make them more effective for the development of the sectoral skills in demand.
- and the compilation of the 12 exchanges as practical examples.
- Networking promotion between Education centres and Industry, students, teachers and workers.
- 4 major needs covered:
 - Enhancement of the participants technical and transversal skills;

	<ul style="list-style-type: none"> • Flexibility in the application of funds to fulfil the strategic goals of the involved institutions; • Organisation of mobilities with different profiles: teachers, students and blue, white and pink collar workers. • Promotion of the study and learning of environmental solutions for the SB and ORE sectors through different kinds of events and mobilities <p>- Technical knowledge acquired: 1) Sustainable ship and shipping; 2) Offshore structures Manufacturing; 3) Automation and Robotics; 4) Environmental impact and solutions for the tidal energy sector; 5) Eco-painting; 6) Future prospects for offshore wind energy; 7) Sustainable wooden boats; 8) Innovation and sustainability in the shipbuilding sector; 9) Renewable energy generation</p> <p>- Transversal skills reinforced: 9 Skills needs detected and promoted: 1) Competence in science and technology / Environmental Literacy; 2) Social and Cross-Cultural Skills; 3) Curiosity and Interaction in Heterogeneous Groups; 4) Digital Communication and Collaboration skills; 5) Adaptation to new technologies / changes in the technologies; 6) Using critical thinking skills and problem-solving; 7) Understanding human, cultural, and societal issues related to technology and practising legal and ethical behaviour; 8) Understanding of technology concepts, systems, and operations; Transferring current knowledge applied to new technologies; 9) Teamwork</p> <p>- Innovative contents were created and used: In presentations and visits (not only because of the new technologies but by addressing the potential environmental impacts and how they are managed within the regulatory and policy regime). Cutting-edge online materials, formats and platforms were used: e.g. break-out rooms, whiteboard tool Jam board (it allows online workshops to flow better within discussion groups).</p>
Benefits	<ul style="list-style-type: none"> - Understand the environmental impact of the SB and the ORE and identify techniques and technologies to reduce it. - Define recommendations for blended mobilities in green technologies for SB and ORE, both for education centres and companies. - Applicable to other contexts such as different settings and geographic locations. -The results demonstrated the added value of both enhancing relationships between industry and education, and also developing interpersonal and transversal skills through the mobility actions. Teachers from the secondary schools involved in this Pilot Experience stressed the benefits of the interaction between industry and education centres and among education centres. - The great advantage of the exchanges was that a network was established between the project partners and those stakeholders involved in the visits and this can develop future collaboration. - Aligned with CEDEFOP's continuing efforts to develop appropriate tools and instruments for the validation of non-formal and informal learning.
Lessons Learned /Recommendations	<ol style="list-style-type: none"> 1. Engage with stakeholders: establishing bridges for knowledge exchange and mobility agreements for short visits or/and longer internships (between the education community and the industry, and also between the different educational levels and profile). 2. Work with industry collaborators: focusing on cutting-edge technologies to learn about them and find relevant solutions to industry and better matching of trainings to current needs.

	<p>3. Take a flexible approach: the undoubted success of these 12 mobilities during the COVID-19 pandemic clearly shows that the objectives can be reached with clear orientations and flexibility.</p> <p>4. Innovate in the analysis and evaluation of the performance of the mobilities, in order to include the learning and feedback of the participants in the design of future mobility activities and in the improvement of the centres in which they are working/studying/teaching. Communication of the lessons learned at the workplace is necessary (including innovation in the communication tool/format/management).</p>
How it may be used/replicated within your or other organisations	<p>The mobility guidelines can be directly used when organising mobilities or mobility programs. The examples of the mobilities conducted in this pilot project can also inspire to replicate similar actions in different contexts. We provide here some examples of transfer of this materials:</p> <ul style="list-style-type: none"> • The mobility guidelines have been transferred to the BRIDGE-BS2 H2020 project in the Black Sea, resulting in an adapted guide for blue mobility entitled “Good Practices on Blue Move Activity”. This guide promotes mobility and knowledge transfer to bring together students with the scientific community and industry to better match current training and skills’ needs with the labour-market demands in the Blue Economy context of the Black Sea. • As a result of collaborative transfer between education institutes and stakeholders, the Sustainable Ship and Shipping 4.0 Master Degree (SEAS 4.0) has integrated the green move methodology to address transversal skills through mobility actions. • In addition, all the project partners involved in the Green Move found the guidelines useful, i.e. the VET providers CIFP Someso, Ferrolterra and CIFP Universidade Laboral; Aquatera Ltd., a UK company leader in providing environmental services related with the MRE sector and University of A Coruña University (Spain). • Mobility programmes are key for knowledge exchange. Some of the Pilot Experiences’ results have been transferred within the visits organized in the framework of the Green Move; e.g. the Airless VR tool developed by CIFP Someso for painting an offshore wind jacket, will be used by an educational centre in France.
Comments/Additional information	<i>No additional comments</i>
References/Links	<p>https://www.projectmates.eu/pilot-experiences/</p> <p>https://www.projectmates.eu/pilotexperience/green-move/</p>

IDENTIFY INNOVATIVE APPROACHES, METHODS, AND POLICIES FOR VOCATIONAL EDUCATION AND TRAINING (VET)

Scope: European

Focus on: Real case studies where good practices were applied such as - work-based learning, student-centered approach, gamification, simulation, digital tools, collaborative approach and etc.

Ecosystem: maritime

Organisation Name *ProSea foundation in collaboration with CETMAR and the CTP project partnership: Europêche and PFA, CEFCM-France, Novikontas-Latvia, BBZ-Germany, Enaleia-Greece, BIM-Ireland, CETMAR-Spain*
[\(https://catchingthepotential.eu/\)](https://catchingthepotential.eu/)

Approach/Method/Policy Name	Catching the Potential: collaborative approach for the implementation of an international standard for sustainable fishing training for fishers.
Country and Year	Netherlands, France, Greece, Ireland, German, Latvia and Spain, 2021, 2022, 2023
Target Group, Scope and Sector	<p>TARGET GROUP: Fisheries organisations, with special focus on fisheries VET training centres.</p> <p>Trainings are addressed at experienced fishers, students at fisheries VET centres and also teachers.</p> <p>SCOPE: European, tested on the Netherlands, Germany, Belgium, France, Ireland, Latvia, Greece and Spain</p> <p>SECTOR: Fishing sector</p>
Background Information/Summary	<p>Catching the potential is a project that started in 2019. The goal of this project is to develop a sustainable fisheries training standard for fishers in Europe (or even the world). As input for this standard, the project conducts sustainable fisheries trainings in seven European member states spread over the various sea basins located within the EU.</p> <p>The project brings together experts on sustainability training, sector representatives, fishing educational institutes and training providers in order to identify and bridge the gap between skills’ offer and demand. The involvement of these stakeholders combines sector knowledge, experience with sustainable fishing training and fishing education expertise. This not only guarantees state-of-the-art, innovative solutions to sustainable fishing training, but also the best fit with sector demands and fishers training possibilities.</p> <p>Background and focus:</p> <p>There is an international standard for the education and training of fishers (STWC-F), however, this standard is not adequately ratified/implemented within the EU (yet). Education of fishers among EU MS, both vocational and safety/ sustainability education, is as diverse as is fisheries itself. It varies from a father to son ‘learning by doing’ approach to formal, professional (higher) education. In this context, sustainability is not structurally implemented as a separate theme in the curricula of fishery education; in addition, the way the training elements are included vary greatly per country.</p> <p>The standard to be developed requires a delicate balance between establishing a general standard for all fisheries and a more custom made/regional approach. Therefore, country specific courses are being organised in seven EU Member States to gain understanding of this balance. These pilots are involving VET Centres and fisheries organisations, and are being supported by the CTP partnership to promote a peer learning approach, gaining from the experience of the different European countries from the partnership (NL, FR, BE, IE, GR, LV, ES). Pilots are addressed to test the sustainable fisheries course with experienced fishers, students at fisheries VET centres and also teachers.</p> <p>These insights gained in the pilots serve as a firm foundation for the development of the standard. The project will write a strategy to incorporate the sustainable education standard for fishers into international policy and start implementation activities.</p>

Implementation

The overall goal of Catching the Potential is to develop an international training standard for all fishers. The standard will be based on the experience gathered in seven European MS, based in the adaptation of the sustainable fishing training course developed by ProSea in the Netherlands.

The main objective of the training is to give a broad view of the concept of sustainability, and to the Triple P concept (Persons, Profit, Planet). The course should also involve fishers in the concept of sustainable fisheries and inspire them to include it in their own thinking and their (future) career in fisheries.

As a starting point, a desk study was conducted to identify best practices on sustainable fisheries training (D2.2), as well as the main rules and regulations relevant for fisheries in Europe (D2.1).

The ProSea training materials were used as a starting point for the development of the pilot trainings. The Dutch materials were translated in English, and organised in 9 presentations available for all the CTP partners, and available in this [link](#):

- 1) Introduction Fishing into the Future
- 2) Marine ecology
- 3) Fisheries management
- 4) Oil and solid waste
- 5) Fishing and society
- 6) Communication
- 7) Overview air emissions and climate change
- 8) Fisheries economy
- 9) Sea the future

A training package was prepared, describing the course with clear class plans. It also details the practical activities and debates to propose in the different sections. To promote the participation of the students and fishers, the lessons include gamified practical activities aimed at triggering debate and reflection among the group. The course finalises with a final assignment, in which the participant present their views on how to improve sustainability in fisheries.

Meetings were organised with all the partners developing pilots of the course, to review these contents and align the training principles and the procedure of the pilot training development.

In addition, the areas where the content needed to be adjusted to the local situation were discussed, addressing practical issues and an implementation timeline.

An adapted local program was developed and tested in each one of the Member States piloting the course (NL, FR, BE, IE, GR, LV, ES). In some countries, a train the trainers course was hold with local teachers; in other cases, the pilot course was conducted in the VET centres using external trainers and having both students and teachers during the development of the course.

CTP partners worked in parallel in the implementation of the sustainable fishing training standard as part of the SCTW-F, establishing direct contact with the IMO groups participating in this process.

<p>Challenges/Limitations Identified</p>	<p>The diverse landscape of fisheries training across the EU: Some of the Member States (MS) have fishery schools or specific education programs (typically 2-4 years) to become a qualified crew member on fishing vessels. Others don't have fisheries education at all. However, these MS do have certified training Institutes offering safety trainings, like the (usually 5-days) Basic Safety Training Fisheries.</p> <p>The need for a customised approach to the teaching, including a local/regional approach, also adapted to the level of responsibility of the trainees and the fisheries in which they will develop their working activity.</p> <p>Sustainable Fishing training entails all aspects of sustainability: planet (environmental challenges), profit (economic viability), and people (acceptance of your business by society - a license to operate). Compared to shipping, sustainable fishing includes a much wider variety of subjects, such as fishing methods, economics, fish stock assessment & management, certification schemes, and communication skills.</p> <p>Compared to the worldwide shipping business, the fishing industry is regional/local and often unique. Even within a country, the variation on fishing methods and regional/local circumstances is stunning. Developing a course for the fishing industry means that all those subjects need to be customised and adjusted to not just national, but regional/local circumstances.</p> <p>Fishing communities are often small and being a fisher has a large cultural component. It is essential to strike the right tone and take the cultural aspects of the fishing community in account.</p> <p>Traditionally, the relationship between fishers and environmental organisations has been, to say the least, difficult. Implementing a course about sustainable fishing requires a thorough process that is based on respect for their profession, building trust and stay away from blaming, as much as, transferring course content.</p> <p>The level of training and education of fishers is often limited to high school and/or vocational training, and they often speak limited or no English. This has important implications for the course that includes new and conceptual subjects like fish stock management or economics. The course language needs to be their native language, and, the information level needs to be customised.</p>
<p>Outcomes</p>	<ul style="list-style-type: none"> - Elements on sustainable fisheries in existing instruments and guidelines of the EU and of UN specialised agencies like IMO, ILO and FAO have been identified (D2.1) - Best practices in sustainability training of fishers in EU Member States have been identified and documented (D2.2) - An international network of fishing academies, training institutes, scientific institutes and sector representatives has been set up, to facilitate the exchange of knowledge, ideas and opinions about sustainability training of fishers. - 7 country specific sustainable fishing courses/trainings for fishery students and active fishers have been organised in at least 7 EU-

	<p>countries; the experience has been documented and analysed to develop a common standard.</p> <ul style="list-style-type: none"> - A training package has been developed and adapted to seven EU Countries. The package includes a course description with clear class plans. It also contains presentations for the trainings, available in English, Dutch, French, Greek, German, Latvian, Spanish and Galician. - An international standard for sustainability training for fishers has been developed, based on best practices and the dedicated country courses; - A strategy for the implementation of that standard internationally (EU, IMO) has been agreed.
<p>Benefits</p>	<p>One of the best things done for the implementation of the standard is use the following methodology: developing a pilot course in the VET Centre using external trainers and having both students and teachers during the development of the course. In our opinion, this has several good consequences. Among them one is to encourage the teachers to introduce new didactic methodologies without the first barrier of having to start from zero creating the materials and doing the initial research.</p>
<p>Lessons Learned /Recommendations</p>	<ol style="list-style-type: none"> 1) The main objective of the training is to give a broad view of the concept of sustainability, and to the Triple P concept (Persons, Profit, Planet). The course should also involve fishers in the concept of sustainable fisheries and inspire them to include it in their own thinking and their (future) career in fisheries. There is a risk of losing this perspective when adapting the course to different countries and target groups. To ensure a proper approach, the CTP standard should be very clear in its descriptions stating how each section of the course tie back to the overall theme of the course, to sustainable fisheries, and to the Triple P concept. 2) When involving experts in sustainability to teach the subjects, it may happen that they tend to convince participants about the importance of promoting sustainability, leading to discussions with individual participants and disagreements. A careful preparation of the teachers/trainers should be conducted to ensure they understand their goal, which is to make the participants think about the subjects, even when they are critical of the content. 3) Adjusting the course to a new situation/country often means adding content, including local examples to the already existing content. Because of this, there will (almost) always be too much information available. The course content for a new situation should keep the overall objective of the course into account, and be a mix between general content and local examples. 4) When adapting the course materials, trainers and teachers sometimes consider to discard parts of the course, and sometimes this will affect to the balance of contents. Therefore, it is important to clearly state in the CTP standard the reasons for the inclusion of each section of the course, and ensure that teachers are aware of them. This will allow them to develop proper adaptations, keeping a good balance of the contents.

How it may be used/replicated within your or other organisations	The CTP standard can be directly used to develop sustainable fisheries training: <ul style="list-style-type: none"> - The training package facilitates the preparation of the lessons, providing a course description with clear class plans. It also contains presentations for the trainings, available in English, Dutch, French, Greek, German, Latvian, Spanish and Galician. - The training package is available for translation to further languages and includes recommendations for its proper adaptation.
Comments/Additional information	<i>CTP project was still on-going during the preparation of this report (the project will finalise in October 2023)</i>
References/Links	<provide used references, documents, materials, videos, or other links> https://catchingthepotential.eu/

IDENTIFY INNOVATIVE APPROACHES, METHODS, AND POLICIES FOR VOCATIONAL EDUCATION AND TRAINING (VET)

Scope: European, National, Local, or Organisational

Focus on: Real case studies where good practices were applied such as - work-based learning, student-centered approach, gamification, simulation, digital tools, collaborative approach and etc.

Ecosystem: maritime

Organisation Name	CETMAR in collaboration with Inova+ and the Green Diving partnership: Berufsbildungszentrum Am Nord-Ostsee-Kanal (BBZ-NOK), Latvijas Juras Akadēmija, Centro Integrado de Formación Profesional Coroso, Associação para o Desenvolvimento e Formação do Mar dos Açores – ADFMA https://cetmar.org/ WWW.INOVA.BUSINESS
Approach/Method/Policy Name	Green Diving - Enhancing green skills, sustainability and attractiveness of Maritime VET
Country and Year	Spain, Portugal, Germany and Latvia 2022 – 2024
Target Group, Scope and Sector	TARGET GROUP: Vocational and Educational Training (VET) Centres (students and teachers) and Life-Long Learning providers SCOPE: European, tested on Spain, Portugal, Germany and Latvia. SECTOR: Several maritime sectors are addressed: Fishing, Navigation, Maritime engineering, Boatbuilding repair & Maintenance.

Background Information/Summary	<p>Green Diving rationale was built having in consideration three needs' levels:</p> <ul style="list-style-type: none"> - European relevance and need expressed in the field of green skills and sustainability capacitation of educational actors, including in the field of Maritime training at various levels (capacity building, resources provision, curriculums update, structures and processes greening...) – confirmed on by key studies (Cedefop, UNESCO, UNEVOC) and projects (MATES, SKILLSEA, ONBOARD); - Consequently identification/confirmation of target group needs both within VET partners schools, as well as others not making part of this consortium, assessed also through a need analysis questionnaire. A total of 120 answers were collected across 4 countries (Germany, Latvia, Spain and Portugal). Among the results, it must be highlighted that 60% of respondents considered that the maritime VET trainings are NOT designed in a way they promote green competences, and near to 40% didn't knew wat to answer to this question. <p>The Green Diving project has a clear twofold objective which has at its grassroots the development of pedagogical teaching resources, capacity building and co-designing processes that will convey:</p> <ol style="list-style-type: none"> 1) Sustainability and green skills development in maritime VET, by working on VET students' level (future maritime professionals), as well as VET teachers/trainers and Maritime VET school directors, 2) The elevation of VET and Maritime professions attractiveness among school communities.
Implementation	<p><i>The global structure of the Green Diving project is constituted of 3 Results, defined in a series of support actions to ensure the achievement of the general objective of the project:</i></p> <ul style="list-style-type: none"> - <i>A Digital Toolkit for Green Skills</i> - <i>A Green Skills Course for VET Teachers Professional Development¹²</i> - <i>An Action Plan for Greener VET Maritime Schools*</i> <p>Digital Toolkit for Green Skills:</p> <p>This toolkit offers a series of tools, materials and resources that will enable VET maritime teachers and VET maritime schools to integrate, explore and develop green and sustainability skills within macro level (school level) and micro level (classroom/students' level).</p> <p>This digital tool will provide theoretical information and didactic digital materials to be used by teachers and school leaders in their educational institutions in order to provide Green Skills and competencies for trainers and students.</p> <p>In terms of content, this document will be based on a set of Green Skills and competencies, stablished by the consortium, constituted by specialists of the field. However, the content and set of competencies built will also take in consideration the already existing resources and projects related to sustainability, like Green Comp, ESCO, SKILLSEA. Thus, the document will present a set class plans and project/activities to be implemented in schools and classrooms, based on each skill defined.</p> <p>Furthermore, as this Digital toolkit for Green Skills aims at fostering and promoting the attractiveness of blue careers both among VET students</p>

¹² * Results still under development during the development of the present report (March 2023)

	<p>(future maritime/blue professionals), as well regular pathways students, a list of careers related to maritime pathway will be presented in this document. Following this line, the toolkit will also provide a set of good practices and extra resources that may be useful for the teachers and school leader to get more information about some important topic that may be useful in the maritime field.</p> <p>It is important to underline that all the content presented in the toolkit will have in consideration partners VET schools specific offer and both EQF 4 and 5 levels: fishing; maritime transport; ports and shipping management; marine engineering. Furthermore, all the content will be translated in Portuguese, Italian, English, Spanish and German, and will be available without additional costs on the website of the project.</p>
Challenges/Limitations Identified	<ul style="list-style-type: none"> - The need to identify a common approach, capable to be adapted to different contexts: different countries, subsectors, or different target groups in the VET training centres may require a different approach.
Outcomes	<ul style="list-style-type: none"> - A Digital Toolkit for Green Skills - A Green Skills Course for VET Teachers Professional Development¹³ - An Action Plan for Greener VET Maritime Schools* <p>All outcomes will be available at the project website https://green-diving.eu/achievements-results/</p>
Benefits	The materials are conceived to promote a bottom-up approach to the green transition, empowering VET training centres to take action in the green transition.
Lessons Learned /Recommendations	Information not available
How it may be used/replicated within your or other organisations	<p>The Action plan for Greener VET Maritime Schools will detail how to use all the materials generated in the process of promoting the green transition in VET Training Centres.</p> <p>It will guide the training centres on how to launch a co-creative process, and how to use the Toolkit and the Trainer the Trainers' course in this process.</p>
Comments/Additional information	Results still under development during the development of the present report (March 2023 and review in December 2023)
References/Links	<p>Link to the Greendiving Train the trainers course materials employed during trainings (gives access to the training materials before they are finalised and uploaded to the website):</p> <p>https://drive.google.com/drive/folders/1I2yQLPBLfF-FOXBOgGEOeWEn4O7kjs4I</p>

IDENTIFY INNOVATIVE APPROACHES, METHODS, AND POLICIES FOR VOCATIONAL EDUCATION AND TRAINING (VET)

¹³ * Results still under development during the development of the present report (March 2023)

<p>Scope: European, National, Local, or Organisational</p> <p>Focus on: Real case studies where good practices were applied such as - work-based learning, student-centered approach, gamification, simulation, digital tools, collaborative approach and etc.</p> <p>Ecosystem: maritime</p>																									
Organisation Name	<p>SKILLSEA blueprint Project, led by the maritime transport industry social partners, the European Community Shipowners' Associations (ECSA) and the European Transport Workers' Federation (ETF) and is comprised of a consortium from national maritime authorities, shipping companies, shipowners' associations, maritime trade unions and maritime education providers from 16 countries in Europe.</p>																								
Approach/Method/Policy Name	Green skills educational packages																								
Country and Year	The Netherlands and Europe, 2021-2022																								
Target Group, Scope and Sector	<p>TARGET GROUP: Vocational and Educational Training (VET) Centres (students and teachers) and Life-Long Learning providers</p> <p>SCOPE: European</p> <p>SECTOR: Maritime Navigation</p>																								
Background Information/Summary	<p>SKILLSEA blueprint Project analyses how the technological developments in the industry of the maritime transport will affect the skills requirements on the workers of the future. New educational packages have been created to support the adaptation of the educational system to the new needs and trends.</p>																								
Implementation	<p>Two Green skills educational packages have been released. The first one, addressed at maritime professionals (at operational and management level) interested in energy-efficient and environmental-friendly ship operations includes 12 lessons of 3 hours each were developed. The lessons Plans are available in English and the topics are (being the ones marked with * those for which presentations are available to be used as examples of training materials):</p> <table border="1"> <thead> <tr> <th>Lesson</th> <th>Topic</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Alternative fuels*</td> </tr> <tr> <td>2.</td> <td>Green legislation in an operational context*</td> </tr> <tr> <td>3.</td> <td>Determining environmental impact</td> </tr> <tr> <td>4.</td> <td>Climate change and the adaptation of transport infrastructure</td> </tr> <tr> <td>5.</td> <td>Energy-efficient operation – power production*</td> </tr> <tr> <td>6.</td> <td>Energy-efficient operation – power consumption*</td> </tr> <tr> <td>7.</td> <td>Energy-efficient operation – energy efficiency awareness*</td> </tr> <tr> <td>8.</td> <td>Data collection and interpretation, I</td> </tr> <tr> <td>9.</td> <td>Data collection and interpretation II</td> </tr> <tr> <td>10.</td> <td>Management of operation in a green context</td> </tr> <tr> <td>11.</td> <td>Improving green performance in an operational context</td> </tr> </tbody> </table>	Lesson	Topic	1.	Alternative fuels*	2.	Green legislation in an operational context*	3.	Determining environmental impact	4.	Climate change and the adaptation of transport infrastructure	5.	Energy-efficient operation – power production*	6.	Energy-efficient operation – power consumption*	7.	Energy-efficient operation – energy efficiency awareness*	8.	Data collection and interpretation, I	9.	Data collection and interpretation II	10.	Management of operation in a green context	11.	Improving green performance in an operational context
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	12.	Introduction to assessment case and methodology	
	<p>A second Green skills package addresses ambitious Deck or Engine Officers who wish to transit from sea to shore or have made this transition already and take up roles with responsibilities including green skills. The duration of the full package is 40 guided learning (contact) hours and 85 self-study hours with an overall workload of 125 hours. The course consists in five main learning streams as core elements:</p> <ol style="list-style-type: none"> 1. Data Processing 2. Calculation and documentation of emissions 3. Vessel performance management systems 4. The role, design and validation of Key Performance Indicators (KPIs) 5. The development of regulation and political structures in the maritime industry 		
Challenges/Limitations Identified	Only a selection of lessons have developed the full presentations to be used as examples of training materials. For the rest of the contents, only the class plan is available.		
Outcomes	Two Green skills educational packages have been released. The lessons Plans are available in English and the topics are (being the ones marked with * those for which presentations are available to be used as examples of training materials)		
Benefits	The choice of educational packages is confirmed relevant for several jobs and skill sets for the current and future maritime professionals. It can enhance mobility both horizontally and vertically and between land and sea.		
Lessons Learned /Recommendations	<p>Mini surveys and open talks were conducted regularly as the educational packages progressed. This led to adjusting the toolbox design's final format and the EPs' shared structure.</p> <p>In terms of content, an important lesson was to ensure that the intent and scope of a given lesson should be articulated clearly (as the assumptions of one developer might not be evident to or shared by the following provider). It can be a challenge for a deliverer not specialised in the subject area to fill in gaps in the toolbox, so a more detailed consideration might be needed for such. Sample teaching materials were always valuable but needed adaptation to delivery, and links to websites should be avoided.</p> <p>For the development of future educational packages, the emphasis should be on suggested lesson plans and detailed, constructive alignment rather than sample material. Lesson examples were welcomed, but fixed flows are difficult to implement.</p> <p>Further, as with all training courses, the evaluation/review is essential to ensure they remain current and of the correct quality. Participants are provided with opportunities to evaluate the delivery and content of the package as part of the toolbox for each educational package. This process should fit with the quality assurance measures adopted in the specific organisation delivering the training.</p>		

How it may be used/replicated within your or other organisations	It is expected that the educational packages developed in SkillSea will be used to assist the development and implementation of future-focused programs and/or courses after customization as relevant.
Comments/Additional information	<i>No additional comments</i>
References/Links	https://www.skillsea.eu/index.php/maritime-education-training-portal/educational-packages/green-skills-1 https://www.skillsea.eu/index.php/maritime-education-training-portal/educational-packages/green-skills-2

IDENTIFY INNOVATIVE APPROACHES AND METHODS FOR VOCATIONAL EDUCATION AND TRAINING (VET)

Scope: European, National, Local, or Organisational

Focus on: Real case studies where good practices were applied such as - work-based learning, student-centered approach, gamification, simulation, digital tools, collaborative approach and etc.

Ecosystem: Automotive

Organisation Name	<i>Renton Technical College (RTC),</i>
Approach/Method Name	<p>Augmented and Virtual Reality Technology in the Classroom</p> <p>Offering students flexibility to access Career and Technical Education (CTE) and STEAM lab courses that require hands-on learning experiences.</p>
Country and Year	<i>United States 2020</i>
Target Group and Scope	<p>Augmented and Virtual Reality Technology in the Classroom</p> <p>Automotive technology program of study</p> <p>Additional industry content in electronics and other transportation-specific topics were also included.</p> <p>a highly ranked, two-year public college located in Renton, Washington</p> <p>academic courses are available to a diverse student body of about 10,000 individuals, which includes full- and part-time students with an average age of 29.</p>

Background Information/Summary	<p>Warren Takata, a full-time instructor of automotive technology, had a major challenge on his hands: how do you teach students remotely, in a program where they spend the majority of their time learning to assemble and disassemble automobile engines?</p> <p>Takata teaches at Renton Technical College (RTC), a highly ranked, two-year public college located in Renton, Washington just a few miles south of Seattle. Both CTE and traditional academic courses are available to a diverse student body of about 10,000 individuals, which includes full- and part-time students with an average age of 29.</p>
Implementation	<p>zSpace at RTC was implemented urgently when the campus facilities closed because of the pandemic, Takata and his colleagues strongly believe that the use of zSpace will only expand when students are able to return to campus. He expects that as other departments see how the automotive students have embraced the laptops, they'll be inspired to use the technology for other subjects.</p> <p>“Warren had already researched zSpace, and once I saw it I agreed we needed to get it into students’ hands as soon as possible,” said Jackson. “We continuously have students moving through the auto- motive program at RTC, and we wanted their learning to continue as seamlessly as possible.”</p> <p>The 3D programme has been developed by GTAFE and is marketed via zSpace. GTAFE offers VR Automotive Mechanic, which is a program that allows students to work in a virtual auto shop, where they can assemble and disassemble the car and its components safely. VR Automotive Expert (also GTAFE), is described as a “3D interactive study guide for automotive training.” The program provides automotive courses and enables students to engage in simulations, review 3D resources, and more.</p> <p>For the automotive program, laptops were pre-loaded with course curriculum, allowing students to complete their lab work from any location.</p> <p>With Takata and Jackson spearheading the effort, zSpace laptops were purchased and deployed in a matter of weeks.</p>
Challenges/Limitations Identified	<p>Major players in the automotive industry understand that virtual reality and augmented reality does not and cannot always take the place of real-life experiences.</p> <p>While automotive manufacturers utilize virtual reality in car design, clay models are still a fundamental part of the process. Regarding the design process, Ford’s Joel Piaskowski told Automotive Magazine that “...Once it gets down to final sign off, it seems like clay is never going to go away, despite all the advances in VR and in computer CAD design and graphics and so on over the years.”</p> <p>Even with technology allowing executives and designers to step into a virtual space to visualize 3D car models, the need for clay may always exist.</p> <p>As Piaskowski explained to the magazine, cars are three-dimensional and a physical model may always be necessary. The physical rendering provides</p>

	designers, engineers, and executives with a means to explore the mechanics in detail and by touch; while virtual allows a graphic 3D display, there is no true sensory integration related to touch.
Outcomes	<p>Increased Student Engagement</p> <p>“The students were blown away,” said Takata. “They’re used to gaming, and described zSpace as an ‘Xbox on steroids.’”</p> <p>While it’s typically challenging to keep students interested in online learning, Takata said that with zSpace, he observed the opposite.</p> <p>“Usually when you transition to remote learning, you worry about students completing the work. With zSpace, a lot of them went beyond the regular lessons. It’s really engaging content, and they dove in even further than their assignments called for, learning on their own about motors and transmissions.”</p>
Benefits	<ul style="list-style-type: none"> • Safe environment • Interactive environment • Learning virtually also could allow students to redo a lesson or try the same repair over again, although programs may differ in this regard. • Lower training costs • Prepping students for industry certifications • Flexibility and remote access
Lessons Learned /Recommendations	Early identification of AR/VR providers can speed up implementation significantly.
How it may be used/replicated within your or other organisations	<p>Organizations can directly contact providers</p> <p>organisations can contact Pact for skills partnerships if they do not have direct access to the organizations or they are missing financial resources or resources in general.</p> <p>zSpace is able to offer the courses internationally.</p>
Comments/Additional information	<p>Automotive courses covered by zSpace</p> <p>Automotive mechanics https://zspace.com/edu/info/virtual-automotive-mechanic</p> <p>Automotive expert https://zspace.com/edu/info/virtual-automotive-expert</p> <p>Electric Automotive Mechanic https://zspace.com/edu/info/vr-electric-automotive-mechanic</p> <p>Hybrid Automotive Mechanic https://zspace.com/edu/info/virtual-automotive-expert</p>

References/Links	https://cdn.zspace.com/collateral/case-studies/CaseStudy-RentonTechnicalCollege.pdf www.zspace.com https://blog.relaycars.com/augmented-reality-in-automotive-education/
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IDENTIFY INNOVATIVE APPROACHES AND METHODS FOR VOCATIONAL EDUCATION AND TRAINING (VET)	
<p>Scope: European, National, Local, or Organisational</p> <p>Focus on: Real case studies where good practices were applied such as - work-based learning, student-centered approach, gamification, simulation, digital tools, collaborative approach and etc.</p> <p>Ecosystem: Any industry</p>	
Organisation Name	<i>PSI High – Problem solving incubator</i> <i>Project based – experience driven HighSchool</i>
Approach/Method Name	Student centered learning, project- based learning, collaborative approach
Country and Year	United States 2021
Target Group and Scope	High school students 9 - 12
Background Information/Summary	<p>PSI High is an immersive, full-time program located within Seminole High School where students work to solve real community, business, and social problems. Students learn best when they are active participants in their learning, collaborating with their peers and teachers to do work that matters.</p> <p>Cotaught and Problem-Based Students explore ideas within three blocks each day: Humanities, STEM, and Innovation. Blocks are hands-on, project-based, and taught by pairs of teachers across multiple subjects and grades. Every project is connected to a need in the community or world.</p> <p>Design Thinking Our courses and business program are grounded in design thinking, a process our students and teachers use to create valuable solutions to real problems using cutting-edge technologies and ideas.</p> <p>Experimental Our students work in the field with local business and community partners to solve real world problems. At the Problem Solving Incubator, we think experience is the best teacher.</p> <p>Relationship-Driven All students are matched with an advisor for their entire high school career. Our world-class college and career counselling program supports students from freshman year through college to ensure every student has the knowledge and</p>

opportunity to achieve their goals.

The ideal student for PSI High is passionate and wants to take control of his or her own learning. Our learners are the innovators and entrepreneurs of tomorrow.

Real-world learning is the priority at PSI High. Projects are organized around key themes—humanities, STEM, and Innovation and Design. All projects have three things in common: a challenge or question, an authentic audience, and a high-quality deliverable. Students complete projects that serve a real need or add real value to the community, made possible through robust partnerships between PSI High and local government, businesses, and non-profit service organizations. Students also select from an enrichment track within the program to specialize in either digital design computer science, or application design.

Working closely with an industry partner for over six months, a team of PSI students recently created a Smart Mirror for Siemens' internal communications group in their Digital Information Technology course. The mirror hangs in a high-traffic, collaborative space at Siemens to communicate time, weather, and important news. The project was fertile ground for the students to master state standards in an authentic and operational way. As real-world projects tend to do, the work created an intersection of required English, math, and science standards as well as professional skills like effective email communication. Additionally, the work fostered design thinking mindsets like creativity, flexibility, and collaboration. Students learned how to assess their progress, identify deficiencies, and figure out how to fill any gaps with more research, experimentation, or ideation. Together, the standards and competencies serve to create future-ready students, prepared to lead and innovate in college, career, and beyond.

Students in the driver's seat

At PSI High, students decide how they want to engage with each project and demonstrate mastery of course skills and content. Throughout high school, students choose the work that they feel best showcases their growth, culminating in a multi-year portfolio of learning which they present formally. Every student's journey is grounded in their unique interests and skills, allowing them the freedom to grow as a scholar and as a person.

Angela Daniel - Former Instructional Strategist

"Our students' future is shaping up to be a place where learning how to learn will be the ultimate skill they'll need to master. That's why it's time we shift the power dynamic and give students a proper seat at the table in their own education."

Future-ready graduates

As a part of the Seminole County Public Schools graduate profile, PSI High has expanded the definition of what it means to be college and career ready. Students collaborate on teams to solve real-world problems and build skills in the district's ePathways Skills for Future-Ready Graduates. Teachers, students, and community partners collaborate through advisement and skill sessions on topics like academic help, personal skills, emotional well-being, and other topics.

	<p>Seminole County Public Schools (SCPS) created ePathways as a symbol of its commitment that high school graduates will leave our district with meaningful diplomas and a clear pathway to high-demand, high-wage employment. SCPS graduates will have both a broad understanding of careers and enough exploration of specific interests to have a clear plan for their future.</p> <p>Mastery, not memorization At PSI High, students continue to revise and iterate on their work until they demonstrate they have mastered the skill or standard. PSI High accomplishes this by abandoning the traditional assignment-driven grade book and replacing it with standards-based grading using rubrics that define when a student has mastered a competency. Every PSI High student curates a portfolio of their work and maps their progress towards mastery of the graduate skills. Every school year, students lead formal presentations of learning aligned to their individual goals.</p> <p>Skills for Future-Ready Graduates Met:</p> <ul style="list-style-type: none"> • Information and digital Literacy • Communication and collaboration • Self-awareness and adaptability • Collaboration • Problem solving Adaptability • Innovation and imagination
Implementation	<p>Initially designed by a team of high school students, PSI High is a program of emphasis at Seminole High School.</p> <p>When district leaders in Seminole County Public Schools learned about the XQ Super School competition in 2015, their first response was to seek advice from students. Derek Jensen, manager of digital and blended learning for the district at the time, invited high school students from around the district to join a design team. In turn, the team gathered insights from their peers.</p>
Challenges/Limitations Identified	<p>What they discovered was galvanizing: students felt bored and alienated, shut out from learning that mattered to them, and frustrated by inequitable opportunities.</p> <p>They responded with the plan for Problem-Solving Incubator, or PSI High. “Designed by students for students,” the proposal declared,</p> <p>“PSI High will serve as living proof that students can play a leading role in changing the world for the better.” In 2021, PSI High had 10 graduates in their first senior class.</p>
Outcomes	<i>Information not available</i>

Benefits	<ul style="list-style-type: none"> • Design by students Immersive experience • Blended learning • Digital school • Putting student into drivers seat. Pee-to peer learning experience, teaches students presentation skills and removes the barrier between teacher and student. • Students work to solve real community, business, and social problems. • Teams of students learn in an environment that looks more like a high-tech office than a classroom and work in teams to solve real-world community, business, and social problems. Students can determine how they will demonstrate their mastery of content as they work on projects that matter to them.
Lessons Learned /Recommendations	Information not available
How it may be used/replicated within your or other organisations	<p>Despite the fact that it is not directly vocational school the system can be very well used for developing green skills learning is project based approach</p> <p>Other organizations may adopt the approach for developing green skills.</p>
Comments/Additional information	<p>The Chinese government approach focuses on cultivating student’s engineering ability to address the phenomenon of “disconnection between teaching and application” behaving as some educators focus on teaching knowledge, but ignore training students' engineering skills, engineering thinking and engineering accomplishment. The established a new engineering-oriented curriculum system to cultivate interdisciplinary talents with strong engineering practice ability by designing innovative teaching pattern, advanced teaching methods and optimized teaching goals.</p> <p>Collaborative learning and project-based learning can be also structured as follows:</p> <ol style="list-style-type: none"> 1) To construct a three-in-one curriculum system of “experiment, practice and internship”. It aims to implement engineering-oriented teaching strategies by designing course contents guided by enterprise needs and taking project as the carrier. 2) To construct an engineering-oriented teaching pattern of “multiple subjects, double tutors”. It wants to establish a netlike teaching model including teaching community of “teacher-student”, learning community of “student-student”, practice community of “student-enterprise” and guiding community of “intramural advisor-extramural advisor”. 3) To construct project-driven teaching contents. It commits to design a teaching chain of “knowledge + experiment + project” following the learning rule of “from perceptual-knowledge to rational-knowledge to practice-knowledge”. This curriculum system, which takes engineering

	projects as cases, takes the cycle of project development as main-line and takes the cultivation of engineering talents as goals.
References/Links	https://xqsuperschool.org/school/psi-high/ https://ieeexplore.ieee.org/document/9028516/figures#figures

IDENTIFY INNOVATIVE APPROACHES AND METHODS FOR VOCATIONAL EDUCATION AND TRAINING (VET)

Scope: European, National, Local, or Organisational

Focus on: Real case studies where good practices were applied such as - work-based learning, student-centered approach, gamification, simulation, digital tools, collaborative approach and etc.

Ecosystem: Any industry

Organisation Name	<i>Tknika</i>
Approach/Method Name	Student centred approach, cross disciplinary learning, collaboration across schools and disciplines
Country and Year	Spain 2023
Target Group and Scope	TVET students
Background Information/Summary	<p>The Basque Country has successfully led its economic recovery</p> <p>TKNIKA is a centre established by the Basque Deputy Ministry of Vocational Education and Training to promote innovation, creativity, and entrepreneurship in vocational education and training (VET) centres across the region. As part of its mandate, Tknika developed the Ikasenpresa programme.</p> <p>The curriculum outlined a compulsory “Business and Entrepreneurial Initiative” module for all vocational education and training (VET) students. As teachers were expected to implement the integrated curriculum and foster the development of the entrepreneurial culture of their students, they required support via materials and methodologies.</p> <p>The Basque Centre of Research and Applied Innovation in VET (TKNIKA) responded by developing the Empresa Joven Europea (EJE) programme in 2005, followed by the launch of Ikasenpresa in 2012. Ikasenpresa helps teachers to better build their “business and entrepreneurial initiative” module, by providing them with learning materials, hosting annual events such as the Ikasenpresa fair, and facilitating peer learning.</p>

Implementation

Ikasenpresa offers an approach focused on the creation of school companies in the classroom. Throughout the learning process, students develop the technical skills and business acumen to become entrepreneurs. They are trained to be dedicated professionals who are either employable or actively entrepreneurial in the face of a changing, unstable labour market.

Ikasenpresa creates an innovative educational context and uses a practical learning methodology that includes the management of new technologies, work tools, and communication.

The practical learning methodology forces students to leave their comfort zone and handle situations or problems that they will face in the labour market. Furthermore, the programme helps teachers to better manage the “Business and Entrepreneurial Initiative” module, by providing them with teaching support and a framework.

In this model, students are the protagonists and the teachers act as facilitators. To reinforce the point that students are expected to take the lead, there is a break away from the traditional classroom. On the first day, when students sit at their tables in the classroom as they have always done, they are asked to put the tables aside and sit in a circle. When the teacher sits down with them at the same level, they immediately realize that the learning process will be different.

In the Ikasenpresa learning package, the rationale for the inclusion of each topic is provided. By fully understanding the rationale, the teacher can decide which part of the package should be addressed and which part can be skipped according to the different capabilities of students. This allows teachers to adjust their teaching styles while following a standard outline. The Ikasenpresa model has been successfully implemented by all VET providers in the Basque Country.

Students create a small company in which they carry on all the related business activities, such as corporate image, administration, marketing, buying and selling, etc. All products are real, and students are one in charge of making and selling them. Throughout the school year they have two General Assemblies in which two representatives take part in the meetings. In the first one, each company is presented to the rest and, in the second meeting, students talk about how everything is going. During the first part of these meetings, they take part into workshops related to communication and point of sales. During the month of February, a fair takes place in which the students work the point of sale and offer their products to the general public.

Over the course of the training programme, students create a small company in which they carry out all business-related activities, such as designing a corporate image, administration, marketing, and buying and selling.

Core building blocks of the programme include:

- Creating a start-up as a learning tool;
- Developing students’ skills to prepare them for employment;
- Presenting entrepreneurship as a viable option

Ikasenpresa facilitates cross-school cooperation where students from different centres gather together to work on soft skills. Through lectures, group discussions and teamwork, students from different backgrounds exchange their experiences, gain knowledge about useful skills, and work together to put it into practice. This gives

	<p>students the opportunity to interact with those from different VET centres and learn about the diverse ways one can be involved in a business.</p> <p>The students are the protagonists and the teachers act as facilitators. To reinforce the point that students are expected to take the lead, there is a break from the traditional classroom model. On the first day, when students sit at their tables in the classroom as they have always done, they are asked to put the tables aside and sit in a circle. When the teacher sits down with them at the same level, they immediately realize that the learning process will be different.</p>
Challenges/Limitations Identified	The material is mostly in basque language
Outcomes	<p>The 2020 European Strategy also insists on the dual aim of lowering the percentage of school dropouts to below 10% and on at least 40% of the younger generation having completed higher education. The fact that the Basque Country shows good results as far as</p> <p>Technology and Innovation Plan - 25</p> <p>both indicators are concerned (dropout rate below 7% and more than 55% of the younger generation having completed higher studies) shouldn't ease the aim of permanent improvement.</p>
Benefits	<ul style="list-style-type: none"> • Practical project-based approach • Peer – to – peer learning • Collaborative approach • Student centred - Students take the lead in developing business ideas • Real product, experience • Ikasenpresa provides freedom to teachers while providing a viable framework • Students are encouraged to interact across disciplines and schools • Tested and established program • Material is updated every year
Lessons Learned /Recommendations	Information not available
How it may be used/replicated within your or other organisations	Institutions may contact Tknica directly, and o start cooperation, most likely the material will need to be translated and adopted to the needs of specific VET institution. Other option is to contact the Tknica via Pact for skills organization.

Comments/Additional information	SCHOOL YEAR	VET SCHOOLS INVOLVED	STUDENT COMPANIES CREATED
	05-06	5	7
	06-07	21	34

	15-16	53	420
	16-17	73	630
	17-18	78	823
	18-19	81	890
	Number of VET schools involved in the program.		
References/Links	https://unevoc.unesco.org/up/entrepreneurial_learning_guide.pdf https://www.euskadi.eus/contenidos/informacion/fpgeneral/es_def/adjuntos/V-PLAN-FP-ENG.pdf https://unevoc.unesco.org/pub/promisingpractices-tnika4.pdf <i>Ikasnpresa methodology</i> https://www.youtube.com/watch?v=a6jBMEWuHpo&t=80s <i>ethazi methodology</i> https://www.atxuri.net/ethazi/?lang=en https://ekingune.tknika.eus/en/program/ikasnpresa/		

IDENTIFY INNOVATIVE APPROACHES AND METHODS FOR VOCATIONAL EDUCATION AND TRAINING (VET)

Scope: European, National, Local, or Organisational

Focus on: Real case studies where good practices were applied such as - work-based learning, student-centered approach, gamification, simulation, digital tools, collaborative approach and etc.

Ecosystem: Automotive

Organisation Name	<i>Lincoln Electric</i>
Approach/Method Name	Use of Simulators, and robotic systems
Country and Year	USA 2023
Target Group and Scope	VET Welding Students

Background Information/Summary	<p>Lincoln Electric’s LEEPS program, in partnership with the National Coalition of Certification Centers (NC3), provides schools with a complete suite of portable, stackable national welding certifications which makes them more competitive and expands job opportunities.</p> <p>LEEPS supports welding schools and programs throughout the nation with the most comprehensive and relevant welding education tools and resources available for advancing specific skills necessary for succeeding in specialized welding fields.</p> <p>Apart from traditional welding equipment Lincoln offers welding simulators and instructional material to instructors and students</p>
Implementation	<p>VET teachers use welding robots to introduce students to automatic welding. Teachers show how welding robotic arms can be programmed using specialised software. They also demonstrate how car parts, metallic structures or industrial equipment can be welded using this technology. Automated welding can be more efficient than manual welding for repetitive tasks. In automated contexts the welder’s role involves handling some of the parts to be welded, programming, operating and troubleshooting the welding robot, and inspecting the quality of the final product.</p> <p>Instructors can select a pre-built curriculum or customize their own with more than 18,000 pages of materials from lesson plans and student handouts, to lab activities and PowerPoint presentations. They can also set permissions and course parameters, manage students and track their performance.</p> <p>Robotic welding</p> <p>Training with complete state-of-the-art solution for robotic welding</p> <p>ClassMate Robotic Training System</p> <p>Teach robotics using the same full-featured teach pendant used in manufacturing and fabrication facilities WeldPRO training program and simulation software allows offline student programming</p> <p>Accelerate student skills and capabilities for high graduation and employment rates</p>
Challenges/Limitations Identified	<p>Installation tools</p> <p>In case of robotics equipment - safety and fume control solutions</p> <p>Training instructors – program train the trainer from Lincoln</p>
Outcomes	<p>42% certification rate increase</p> <p>23% faster</p>
Benefits	<p>Reducing training costs</p> <p>Tracking material usage</p> <p>42% certification rate increase</p> <p>Safer environment</p> <p>23% faster</p> <p>Mobile learning</p> <p>Immediate analysis</p> <p>Benchmarking to other campuses</p>

	<p>Opportunities to collaborate in networks of educators</p> <p>Instructor training</p> <p>Turnkey certification systems</p> <p>Industry partner access</p>
Lessons Learned /Recommendations	Information not available
How it may be used/replicated within your or other organisations	<i>This method can be used simple by purchasing solutionbs from Lincoln.Custome training is available</i>
Comments/Additional information	<i>No additional comments</i>
References/Links	<i>https://ch-delivery.lincolnelectric.com/api/public/content/b2883e8feeca4d0f8652e87d92a28013?v=db815cc3</i>

Based on our knowledge and available resources, SWANTEC would contribute for a Greener Education with the following two learning approaches:

1. Digital tools with graphical visualizations

The digital tools can make the VET system greener with graphical visualizations of the industrial processes and technical principles.

We are discussing the possibilities of developing a special “Training” module in our simulation software system for supporting training of welding and joining techniques. This will graphically illustrate the working principles of the welding and joining processes and techniques.

2. Virtual reality supported with numerical simulations

The virtual reality supported with numerical simulations can demonstrate the dynamic working principles and interactions of the industrial processes and technical systems.

In addition to the graphical visualizations, it would be more advantageous to make the digital training tools with dynamic interactions of the working principles by combining with the virtual/numerical simulations. The students not only can see the working principles of the industrial processes and technical systems, but also can experience how the processes and systems would interact dynamically with the important control parameters.

HOW DOES GREEN TRANSITION BECOME PART OF TEACHING IN SCHOOLS?

1. Most of the survey is at a school that works with green transition.

Most respondents say that work is being done with green transition at their school. If we ask whether green

transition is part of the official guidelines, more than half answer no or do not know. It therefore seems that for many it is **voluntary** to work with green transition, and that they do not do so because there are no official requirements behind it.

2. Green transition is especially becoming part of teaching through the technologies taught.

Green transition becomes part of teaching in many ways. This is done through the technologies taught, the examples and assignments used in teaching and by integrating elements of green transition into existing subjects. Several of the respondents also comment that the SDGs and **everyday practices** are ways to work with green transition.

3. Technologies for green transition range widely

The technologies relevant to the green transition used in teaching cover everything from green energy technologies to resource optimization. In pedagogy, the focus is on acting sustainably and getting students to think along the same lines.

4. Green transition can be integrated into existing courses

Green transition and the SDGs are actively used in teaching in the form of the tasks that students are asked and the examples that are used. Several respondents also express the view that **the transition can advantageously be made a natural part of existing subjects**.

5. Green transition only to a lesser extent leads to new courses, courses or classes

Respondents find it harder to see that green transition has led to new courses, courses and teams. The focus is mainly on integrating green transition into existing courses and courses.

ATTITUDES TOWARDS GREEN TRANSITION

1. For the majority, green transition is important to include in teaching

Most respondents agree or strongly agree that it is important that green transition becomes part of education – only a few disagree.

2. The vast majority believe that green transition affects what is taught in schools

This probably reflects the fact that for some it is a bound task to work with, and that the vast majority find it important to make sustainability part of the teaching.

3. Green transition will to a large extent become part of the teaching, as teachers are good at creating relevant teaching and are supported by management.

In continuation of this, a small number of respondents point out that it is **enthusiasts** who carry it into the teaching. Few point to continuing training taking place, although there is a **great need**

4. Close to half of the respondents point to lack of skills as one of the biggest challenges to succeed in making green transition part of teaching

This is followed by **a lack of knowledge about** what is green and should be included in the teaching. The remaining points are fairly evenly distributed, indicating that respondents see many different challenges in making green transition part of the teaching.

TEACHERS' NEEDS

1. The vast majority of respondents point to a need for continuing education as well as professional sparring and networking to make green transition part of teaching.

New competences and skills are needed for the green transition. A part, but fewer, respondents also believe that new learning resources, facilities and learning environments are needed.

2. In particular, it points to the need for more time to upgrade skills and knowledge about new green technologies.

Respondents have identified several needs in the field of continuing training. Several point to the need for more time to **upgrade skills and knowledge** about new green technologies that are in use in **the business community**.

3. Professional sparring and networking can create value.

Several mention that professional sparring and networking can create good value – both within their own subject areas and across subjects and schools.

4. Need for technologies for teaching relevant to green transition.

It points to the need for **updated technologies** relevant to the green transition that can be used in teaching. A few respondents point to generally poor facilities and learning environments.