D4.2.

Creation of an online training platform that will incorporate the MOOC with virtual labs.

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1 Executive summary

The NS4nZEBs project addresses the growing skills gap in the construction sector by developing innovative digital learning solutions for professionals involved in Nearly Zero Energy Buildings (nZEBs). As foreseen in the Grant Agreement, Deliverable D4.2 presents the development of an online training platform integrating Massive Open Online Courses (MOOCs) with interactive virtual laboratories to support practical, competence-based learning.
The platform combines six multilingual training programmes, interactive learning resources, virtual laboratories, serious games, automated assessments, digital microcredentials, and Europass Certificate Supplements into one integrated learning environment.

2 Introduction and Objectives

The transition towards Nearly Zero Energy Buildings requires a workforce possessing new technical competences in renewable energy systems, building integration, smart technologies and energy-efficient construction.
Traditional classroom training alone is insufficient to develop these practical competences. Therefore, the platform combines theoretical knowledge with interactive learning methodologies, practical exercises, virtual simulations and digital assessment tools, enabling learners to acquire both technical knowledge and practical competences regardless of their geographical location.

The objective of T4.2 was to create an accessible digital learning environment supporting upskilling and reskilling across the construction value chain.

3 Pedagogical Approach

The platform was developed following a competence-based learning approach that combines:

- theoretical online learning;
- interactive practical exercises;
- scenario-based learning;
- reflection activities;
- serious games;
- automated assessments.

Special attention was given to supporting vocational education and training by translating real working situations into interactive digital learning experiences.

The developed learning environment enables learners to progressively acquire knowledge before applying it within practical simulations.

4 Development of the online Training Platform

4.1 Learning Management System

A dedicated online Learning Management System (LMS) was developed to host the NS4nZEBs MOOC.
The platform provides six complete learning programmes:

- Trainers
- Architects
- Electrical Engineers
- HVAC Engineers
- HVAC Installers
- PV Installers

The Trainer course is intended to support vocational education and training (VET) providers and trainers in delivering the NS4nZEBs curriculum using innovative teaching methodologies and digital learning tool
The remaining five professional courses have been localised and made available in multiple languages to maximise accessibility and facilitate widespread adoption across Europe.

4.2 Multilingual implementation

To maximise accessibility, the professional training programmes were translated into:

- Bulgarian
- Dutch
- Greek
- Italian
- Spanish
- Ukrainian

The multilingual approach enables professionals from different countries to access the training in their native language, thereby reducing language barriers and increasing participation in lifelong learning.

5 Integration of virtual labs

Practical skills are essential within vocational education. For this reason, the project integrated virtual laboratories directly into the online learning platform.

Rather than relying on expensive virtual reality equipment, the consortium selected an accessible digital approach that allows realistic practical learning experiences using standard computers and mobile devices.
Interactive learning environments were developed using ThingLink, enabling learners to explore realistic working situations, analyse installations, answer practical questions and receive immediate feedback.
This approach provides a scalable solution that can easily be adopted by VET providers throughout Europe.

5.1 Virtual Lab Scenarios

Several virtual laboratories were developed based on authentic professional situations.
Each scenario is designed to:

- simulate realistic working conditions
- guide learners through specific tasks
- test technical and problem-solving skills

The scenarios enable students to practice procedures, make decisions, and receive feedback in an interactive environment, which contributes to better learning outcomes.

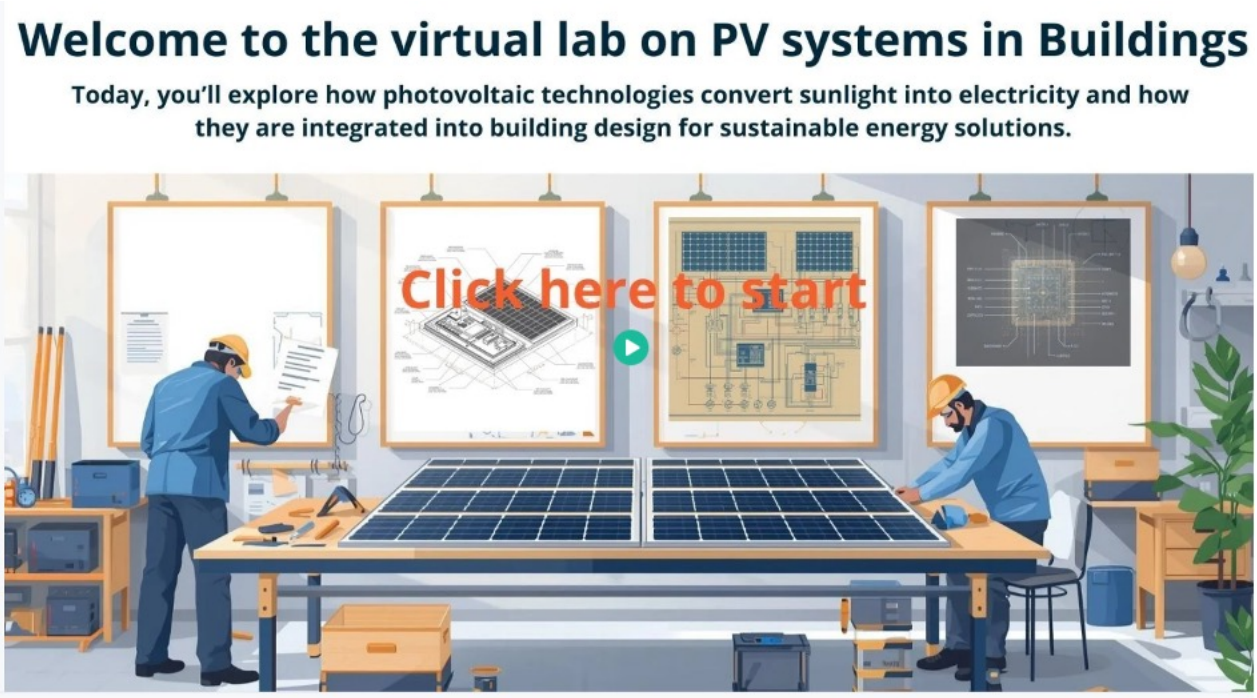
Examples include:

PV Systems in Buildings

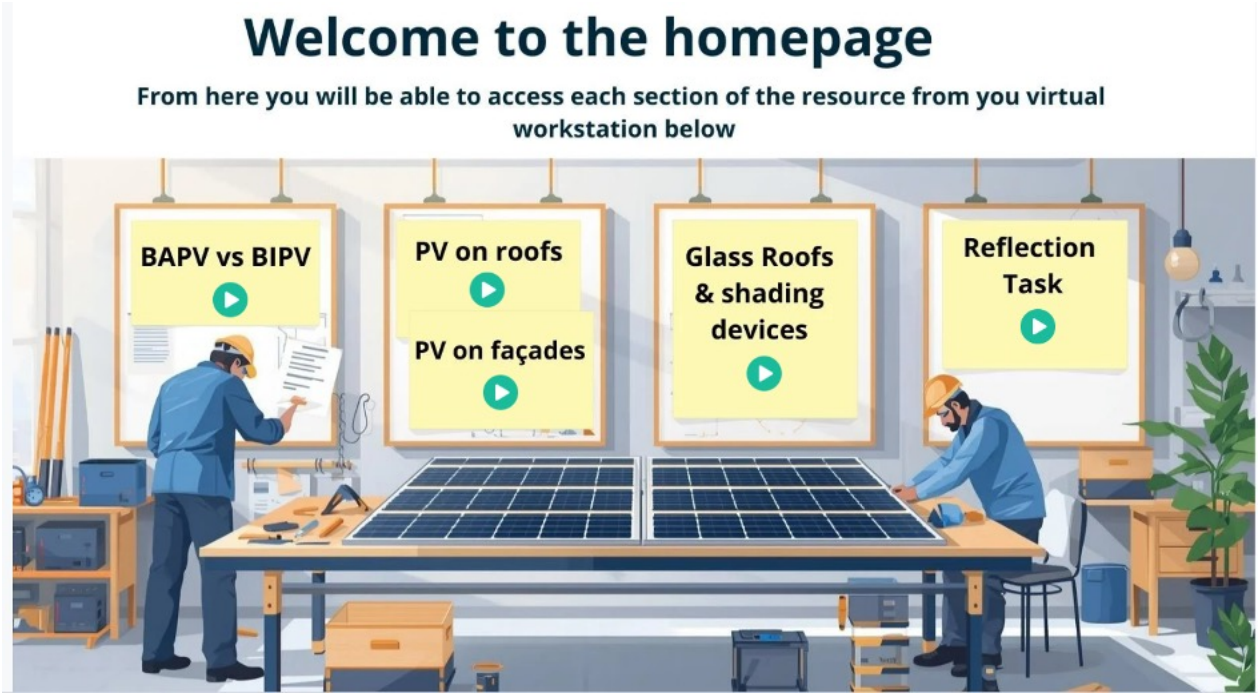
Learners analyse different PV integration techniques including:

- Building Applied PV
- Building Integrated PV
- Roof installations
- Façade applications
- Glass roofs
- Shading systems

Each section combines explanations with interactive questions and concludes with a reflection task.



Clicking the start button takes you to a second screen where you see various items related to PV panels in buildings. Each item first provides an explanation, followed by a short question.



PV on roofs

In this lab you'll explore how photovoltaic (PV) systems can be installed on different types of roofs and the challenges and solutions associated with each.

PV modules on flat roofs

PV modules on pitched roofs

Reflection task

Now it's your turn to show what you've learned. This short quiz will test whether you truly understand every option for integration of PV systems in buildings — and whether you can apply the theory to real-life situations.
You'll answer 5 questions in just 2 minutes. Be quick, be precise, and prove that you're ready to advise clients with confidence!

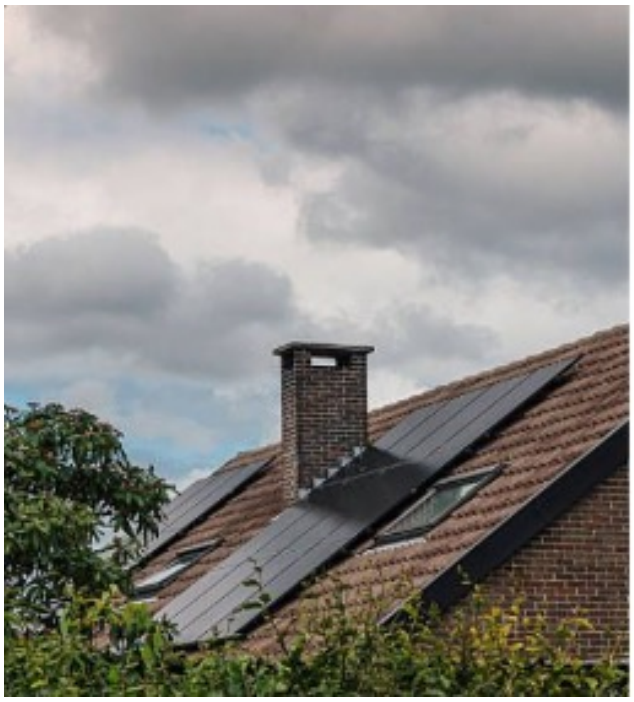
Click here to start

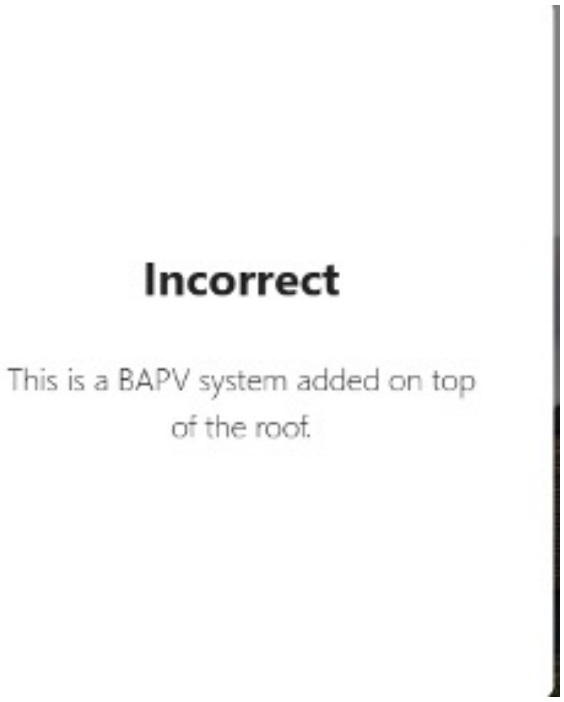
Reflection task

Question 1: Click the roof that shows BIPV installation

Correct

In BIPV systems the PV modules are the roof material.





Solar Thermal Systems

Interactive scenarios guide learners through;

- Components of Solar Thermal Systems
- Types of Solar Thermal Systems
- Types of Solar Thermal Collectors
- Reflection Tasks

6 Serious Games and Interactive learning

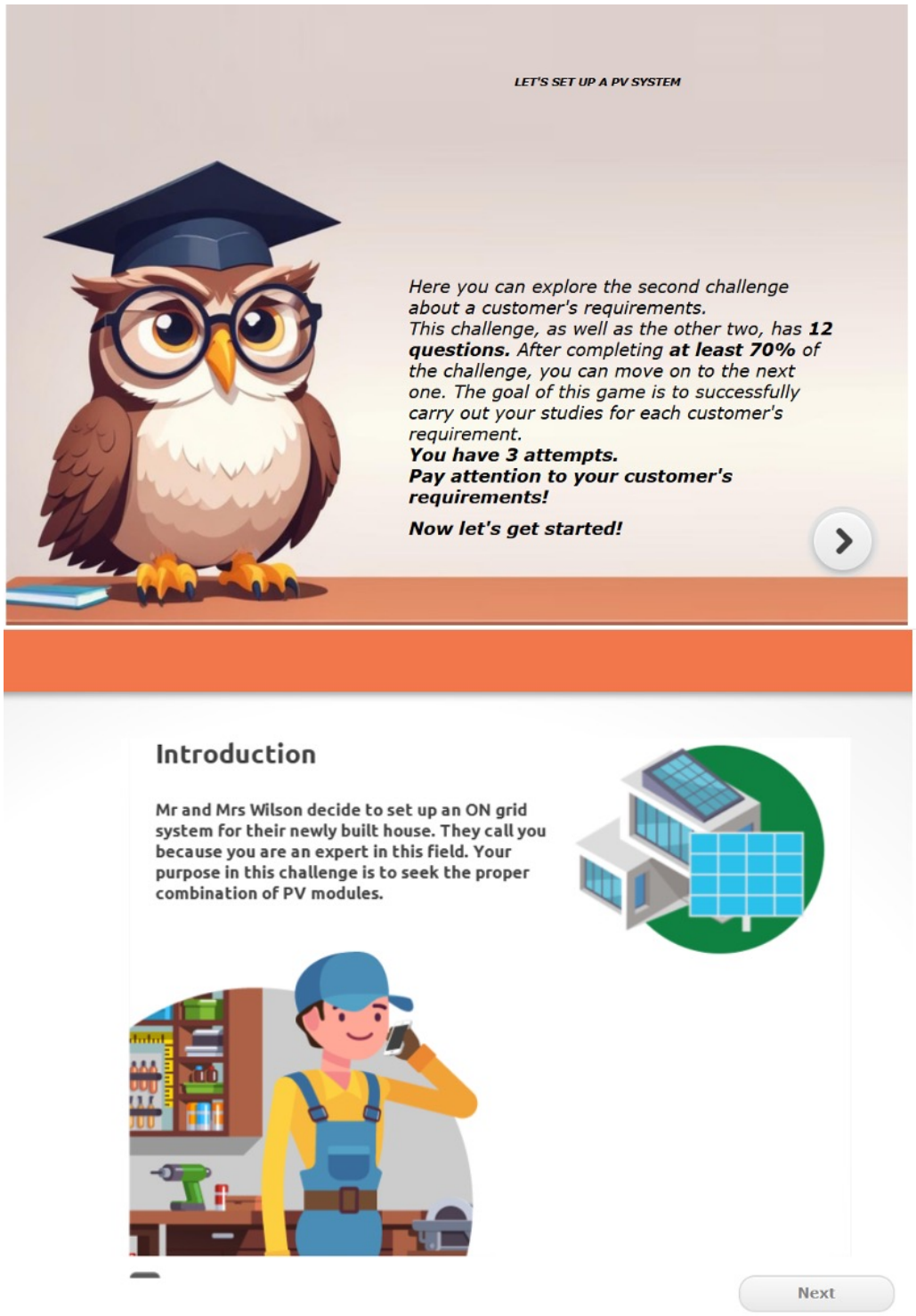
To increase learner engagement, several learning modules include serious games. Participants are placed in realistic customer situations requiring technical decisions. These game-based learning activities enable participants to:

- solve realistic technical challenges;
- apply knowledge in simulated professional contexts;
- receive immediate feedback on their decisions;
- develop problem-solving and critical thinking skills.

The Serious Games introduce an engaging and learner-centred approach that supports competence-based education.

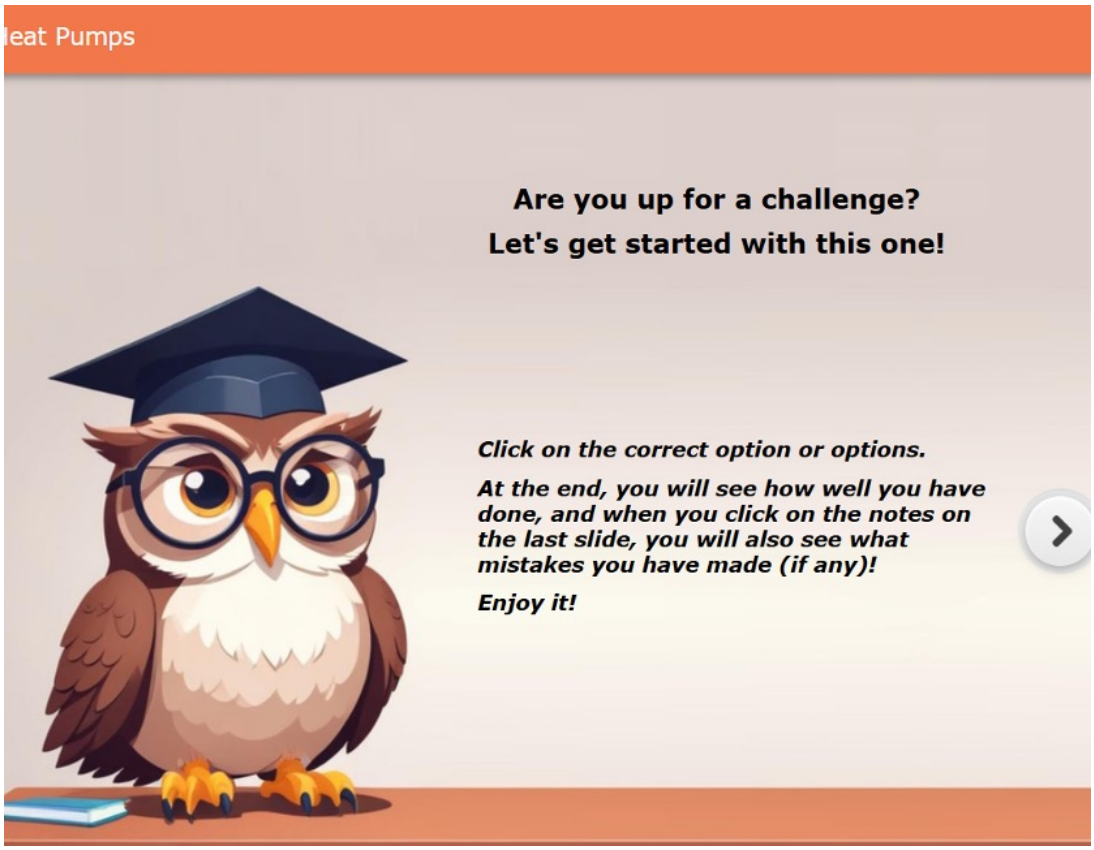
6.1 Serious game - PV panels

The first open e-learning module covers PV panels—through an interactive game, the student must make proposals to the customer and solve various problems.



6.2 Serious games - heat pumps

In the same way as the first open e-learning module, a module has also been created on heat pumps. By creating a fictional scenario with a customer, the student's level will be assessed through a series of questions.

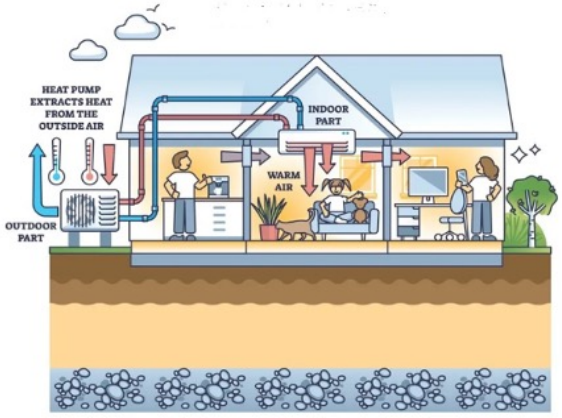


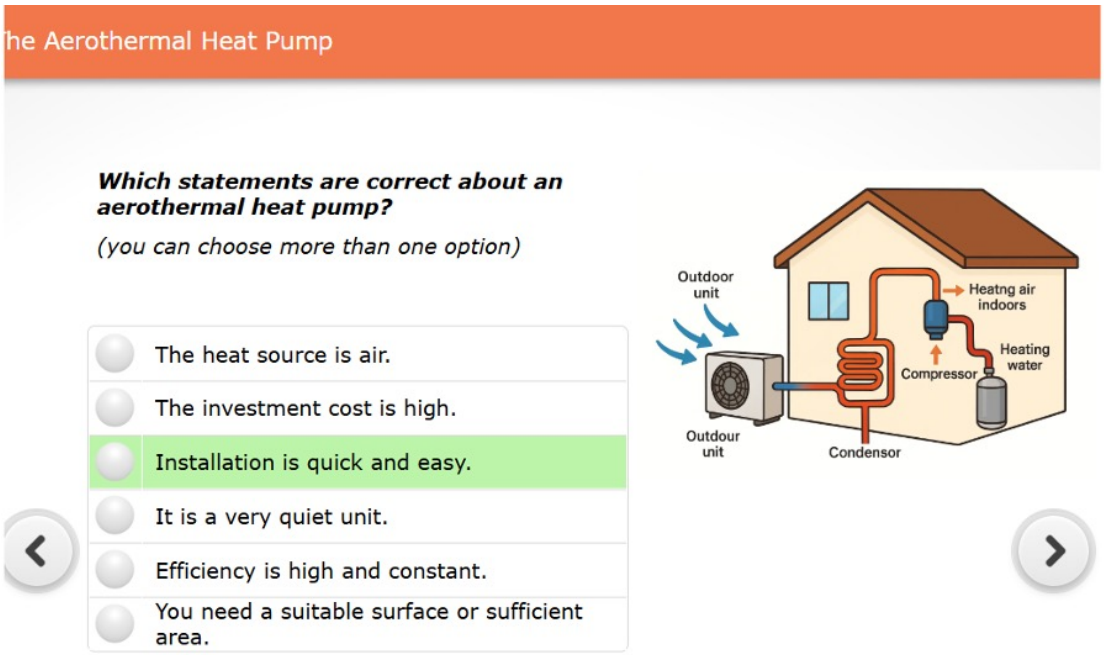
et's get acquainted with the clients!

Mr and Mrs Robinson are considering the purchase of a heat pump for their newly built home. Their house is in a country with a temperate climate. They are still hesitating between an aerothermal and a geothermal heat pump. As their new home has already used up a large part of their budget, they are looking for a more cost-effective solution. So they turn to you for advice and assistance.

What kind of heat pump do you see in this picture?

- Air-to-air heat pump
- Air-to-water heat pump
- Ground-to-air heat pump





7 Assessment and Certification

Knowledge acquisition is evaluated through automatically assessed quizzes embedded throughout the courses.
Successful completion results in:

- digital microcredentials;
- automated progress tracking;
- Europass Certificate Supplement after completion of an entire learning programme.

The assessment system provides immediate feedback while reducing administrative workload for training providers.

8 Pilot Testing and Validation

The platform and virtual laboratories were validated through pilot activities involving project partners and vocational education providers.
The pilots confirmed:

- pedagogical relevance;
- usability of the platform;

- technical functionality;
- applicability within vocational education;
- suitability for replication across Europe.

Feedback collected during the pilot phase resulted in improvements to navigation, learning activities and instructional materials.

9 Results and Impact

The developed platform represents one of the key exploitable results of NS4nZEBs. It contributes to:

- digitalisation of vocational education;
- improved accessibility of training;
- lifelong learning;
- competence development;
- harmonised nZEB education across Europe;
- better recognition of acquired competences.

By integrating MOOCs, virtual laboratories and interactive learning tools into one coherent digital environment, the project significantly strengthens vocational education for the construction sector.

10 Sustainability and Future Exploitation

The platform has been designed as a sustainable resource that will remain available beyond the lifetime of the project.
Its modular structure allows new learning content, virtual laboratories and future technologies to be incorporated with limited effort.

The multilingual design, digital certification system and accessibility for VET providers ensure that the platform can continue supporting upskilling and reskilling initiatives throughout Europe after completion of the NS4nZEBs project.