Didactic and methodological notes for:

Module 2: Customer request for a photovoltaic system

Goal of the module
The learning module targets learners from different trades, primarily roofers and electricians. It is designed for a period of ten lessons of 60 – 90 minutes duration. The training program aims at students which are at EQF Level 2 of the beginning of the training and at EQF Level 4 at the end of the training. The module is best held at the mid to the end of the training program. The module focusses on a request for customer advice on the installation of a photovoltaic system (pv-system). To successfully complete the learning module, skills from different professions are required. For this reason, the traditional skills of one trade are supplemented by skills from other trades. These are specific to this module: • Roofers: Working with hazardous voltages. Components of a pv-system and their functions. Assembly of electrical components. • Electricians: Working at heights with regards to safety and protection gear. Roof construction and where to move safely. Assembly of pv-panels on roof tiles.

Competence profile related to the VQTS-Matrix			
Competence areas	Competence devolpment steps	Level	Interdisciplinary / cross-disciplinary competences
Assembly, disassembly and disposal of building systems and their components	He/she can assemble and disassemble components of building systems according to ex-	EQF Lv. 4	The ability to recognize and understand relationships, to analyse complex systems, to deal with uncertainty

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	isting assembly and installation plans and in compliance with applicable standards, regulations, and laws. He/she can professionally separate components and building materials while the disposal of building systems. He/she can plan and document the assembly and disassembly of components of building systems according to customer specifications and in coordination with authorities, architects, and system manufacturers, considering legal requirements. He/she can dispose of the professionally separated components and building materials of building systems in accordance with legal regUlations. He/she can estimate workloads and report possible problems to superiors.		
Cost control and monitoring for the life cycle of a building system	He/she can determine and document basic data for tracking cost of building systems in accordance with guidelines.	EQF Lv. 4	A basic knowledge about the different technical systems in a building and their interconnection
Communication across trades,	He/she can understand basic technical terms of his/her own and other trades.	EQF Lv. 4	The ability to communicate and collaborate with employees from other trades

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also in foreign languages	He/she can conduct conversations with supe- riors and employees of his/her own and other trades and customers in an appropriate man- ner while presenting and explaining facts. He/she can read product data sheets and carry out assembly and operating instructions of his/her own and other trades.		

Competence profile related to the matrix for sustainable thinking and acting	
Competence area	Competence development steps
Energy conservation: competence related to the identification and application of practices to reduce energy consumption, with the aim of reducing environmental impact and associated costs.	He/She leads the implementation of energy conservation systems, developing initiatives that optimize consumption in installations and maintenance processes.
Energy efficiency practices involves the knowledge and application of techniques to reduce energy consumption, promoting practices that optimize efficiency and reduce waste.	He/She identifies opportunities to improve energy efficiency in projects and implements them in his/her work.
Evaluation of energy alternatives and cost reduction: analyse different energy alternatives, assess their feasibility and	He/She evaluates and selects appropriate energy alternatives to reduce costs and

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efficiency, and develop recommendations for cost reduction and improved environmental performance.	improve environmental performance in their tasks.
Interdisciplinary collaboration: working effectively in multidisciplinary teams, collaborating with professionals from different areas to achieve common goals related to sustainability and environmental improvement.	He/She works with others on basic tasks, understanding the importance of collaboration to achieve sustainable goals.

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Country	**Where can the module be implemented** in your national curriculum?
Germany	• Dachdecker/In - Lernfeld 16. • Elektroniker für Energie- und Gebäudetechnik - Lernfeld 11. • Elektroniker für Betriebstechnik – Lernfeld 11
Netherlands	• Monteur elektrotechnische installaties gebouwde omgeving • Eerste monteur elektrotechnische installaties gebouwde omgeving • Technicus elektrotechnische installaties in de gebouwde omgeving • Eerste monteur woning

In which way does the module enrich the content of one profession with qualification requirements from previously unrelated areas
• The module enriches eletricians' training with the perspective of working at heights and specifically on roofs of buildings. • The module enriches roofers' training with the aspect of working with hazardous voltages and general principles of electronics. • It introduces new safety rules and protective gear to both electricians and roofers. • The module introduces sustainable aspects like carbon emission reduction to the current curriculums.

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- It enriches roofers' training by the aspect of calculating energy yield and dealing with aspects which lead to reduced output power.

Training plan			
Title of the lessons / individual units	Competences	Duration / volume in training hours	Comments
1. Analysis of the customer request.	The students learn to analyze the customers needs and expectations and deduct a working plan from that.	60 – 90 Minutes	
2. Output power and beneficial factors for output power.	Students learn how to calculate output power of a photovoltaic system. They will also learn about factors which will reduce and also increase output power in a wa that they are able to estimate output	60 – 90 Minutes	

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	power for other pv-systems.		
3. Components of a photovoltaic system.	Students learn about the components needed for a photovoltaic system and their specific function within the system.	60 – 90 Minutes	
4. Risks while working and appropriate safety measures.	Students learn how to assess risks while working and to prepare with safety and counter measures.	60 – 90 Minutes	
5. Installation process and needed tools.	Students learn effectively how to install parts of photovoltaic systems and how to assemble pv-panels.	60 – 90 Minutes	This is an optional lesson. It depends on the institution you are teaching at whether you can conduct such a practical approach or not.
6. Connecting the PV system to the grid.	Students learn how to connect the isolated pv-system	60 – 90 Minutes	This is an optional lesson.

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	to the public grid. They will also learn about regional laws and reulations when connecting energy supplies to the public grid. Students learn how to draw schematic diagrams of simple systems.		It depends on the institution you are teaching at whether you can conduct such a practical approach or not.
7. Calculating cost and amortization time.	Students learn to calculate cost of a photovoltaic system and the time it takes for the system to amortize. Further students learn how to vet pv-systems for rentability.	60 – 90 Minutes	
8. Comparison of photovoltaic systems and fossile fuels in terms of carbon footprints and the future.	Students learn about the problems of fossile fuels (carbon emission, climate change and scarcity) and compare carbon footprints of pv-systems with footprints of fossile	60 – 90 Minutes	

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	fueled systems. They will further learn about aspects of sustainability and recycling during the lifespan of a pv-system.		
9. /10. Preparing presentation/pitch and giving presentation.	Students learn how to visualize and convey information. Creativity is supported in the way that the final product is of students choice.	60 – 90 Minutes	
*11. Final exam.	This is the assesssment for the learning process throughout the module.	60 – 90 Minutes	The final exam is not necessarily needed as the portfolio can already be taken into account for the asssessment of a student's work.

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Description of the tasks for competence assessment
Lesson 1: • Clearly describe the assignment and the client's expectations. • Identify three reasons why solar energy and safety are important. • Explain how a photovoltaic system affects costs and environmental impact. *Lesson 2:* • Analyze the roof orientation and determine the optimal placement for solar panels. • Calculate the potential power output based on the available roof surface and tilt angle. • Describe how weather conditions and shading affect solar panel performance. *Lesson 3:* • Create a poster or visual overview of the components (panels, inverter, mounting system, cabling, and connection to the electrical panel). • Describe the function of each component and how they work together in the system. • Explain which components are required for the scenario and why. *Lesson 4:* • Identify and describe at least three risks associated with working at heights. • Develop a plan with appropriate safety measures and required protective equipment. • Explain how the use of sustainable materials can enhance safety. *Lesson 5:* • Describe step by step how to install a PV system. • Specify which materials and tools are required. *Lesson 6:* • Design an electrical diagram for grid integration. • Describe the safety regulations and procedures. *Lesson 7:*

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- Calculate the total costs and payback period of the customer's PV system.

Lesson 8:

- Compare the CO_2 savings of solar panels with fossil fuels.

Lesson 9/10:

- Prepare a professional presentation that convinces the customer of the benefits of solar energy.
- Choose an appropriate presentation format (e.g., video, brochure, conversation).
- Justify the proposed solution with calculations and scenario-specific data.
- Respond to potential customer questions or objections.

- Check your own learning process with the “can-do-checklist" and see if you have trained all competences needed in this module

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