



Learning Units for Vocational Education



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Project Coordination



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Project Partners:



Vocational Training Institution of the Construction Industry Berlin-Brandenburg e.V. (BFW-BB)



Vocational Training Centre JEDU Nivala



Construction School Andrea Palladio (SCVAP) Vicenza



Stichting CHAIN5



Construction School Complex No.1 (ZSB1) Poznań



University of Technology (PUT) Poznań

<https://co4health.eu/en/partnerschaft>



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Table of Contents

Introduction to Learning Units	4
Learning Unit 1 - Basic Knowledge for Healthy Building	5
Learning Unit 2 - Thermal comfort - Introduction to thermal comfort	9
Learning Unit 2.1 – Thermal comfort – Frost Protection.....	14
Learning Unit 2.2 – Thermal Comfort – Airtightness in construction	18
Learning Unit 2.3 – Thermal comfort – cold / thermal bridges	23
Learning Unit 2.4 – Thermal comfort – thermal insulation materials	28
Learning Unit 2.5 – Thermal comfort - correct installation of thermal insulation	35
Learning Unit 3 – Moisture Comfort.....	42
Learning Unit 3.1 – Moisture comfort – Moisture sources	49
Learning Unit 3.2 - Moisture comfort - moisture damages in different materials	54
Learning Unit 3.3 - Moisture comfort - responsible working to avoid moisture damage	59
Learning Unit 4 – Environmental Protection – Green Buildings.....	64
Learning Unit 5 – Usage of healthy materials in buildings	69
Learning Unit 6 – Safety of building process	76
Evaluation of Learning Units & Lessons learned	83
Supplemental Material & Reading	84

Introduction to Learning Units

Co4Health aimed to further develop training in construction professions in line with the identified competence requirements and to strengthen teachers' skills in the field of healthy building.

The learning units were developed using expertise from five EU countries and the latest findings from science and research.

Furthermore, the learning units developed in the project are based on the competence matrix and learning scenarios developed in advance. In line with the competence matrix, they focus on enabling the teaching of both industry- and occupation-specific as well as cross-occupational competences.

They are suitable for both classroom teaching as well as online learning courses.

The topics were selected with reference to their importance and significance in the field of healthy building. Additional focus was given to country-specific specialties – for example; the development of the frost protection learning unit was led by our Finnish partner, who has the most experience with frost protection. However, all project partners developed these learning units in close cooperation and collaboration in order to ensure maximal transferability across countries.

Learning Unit 1 - Basic Knowledge for Healthy Building

Lead: *Kompetenzzentrum für Nachhaltiges Bauen Cottbus (BFW-BB)*
Support – Project partners

TARGET GROUP 1:

- Students/ Apprentices,
- trainees in all building trades /professions (level 4)

TARGET GROUP 2:

- Foreman, master craftsmen in building construction (level 6)
- Trainers, teachers, instructors (level 6)

THE WAY OF IMPLEMENTATION:

- Power Point Presentations
- Short videos
- Handouts

PRE-REQUIREMENTS

The introductory requirements include the knowledge in the following areas:

- Basics of building construction
- Basic knowledge of sustainable building practices
- Basic knowledge of building physics

LEARNING OBJECTIVES

Knowledge:

- Definition of a healthy building
- What is building biology
- Impact of building biology on construction quality and the health of the user
- Building biology agenda 2025
- The 25 guidelines of building biology

Skills:

Handling and installation of healthy building material

Competence:

- Participant can assess the influence of building physics parameters on healthy living

MAIN CONTENTS

- a) Basics of healthy building
- b) What is building biology
- c) Impact of building biology on construction quality and the health of the user
- d) Building biology agenda 2025
- e) The guidelines of building biology

METHODS

- Lecture and presentation
- Discussion (questions and answers)
- Short - videos

ENVIRONMENTS

- Classroom with access to the Internet
- Set of tablets; one for each participant

MEDIA & TOOLS

- Training material in a form of paper documents,
- Power point presentation,
- interactive white board
- computers with access to the Internet
- video about the practical examples

EVALUATION

- Knowledge test,
- Evaluation questionnaire

Duration of a learning unit: 90 Minutes

Time schedule of learning unit 1 Healthy buildings

STEP	CONTENT	TEACHING AIMS	METHODS	LOCATION	TOOLS AND RESOURCES	ASSESS-MENT	TIME [min]	COMMENTS
1	Introduction building biology	<p>Understanding what is building biology:</p> <ul style="list-style-type: none"> definition, goals, fields of work 	Lecture and presentation (Group of 25-28 students)	Classroom / training room with access to the internet and with IWB	<ul style="list-style-type: none"> Training material as a digital hand-out PowerPoint Presentation You tube video (5:38) 	Constant feedback from participants: Questions asked by lecturer during the lecture	10	
2	Impact of building biology on construction quality and the health of the user	<p>Understanding risk factors in indoor spaces</p> <ul style="list-style-type: none"> 3 risk groups polluters and pollutants 	Lecture and presentation (Group of 25-28 students)	classroom /training room with access to the internet and with IWB	<ul style="list-style-type: none"> Training material as a digital hand-out PowerPoint Presentation 	Constant feedback from participants: Questions asked by lecturer during the lecture	25	
3	Building biology Agenda 2025	<p>18 goals of the Building Biology Agenda directives, guidelines, standards and benchmarks</p>	Lecture and presentation (Group of 25-28 students)	classroom /training room with access to the internet and with IWB	<ul style="list-style-type: none"> Training material as a digital hand-out PowerPoint Presentation 	Constant feedback from participants: Questions asked by lecturer during the lecture	10	

4	The 25 Guidelines of building biology	Indoor climate Building materials and interior design Interior design and architecture Environment, energy and water Eco-social living space	Lecture and presentation (Group of 25-28 students)	classroom /training room with access to the internet and with IWB	<ul style="list-style-type: none"> • Training material as a digital hand-out • PowerPoint Presentation 	Constant feedback from participants: Questions asked by lecturer during the lecture	30	
5	Building biology guide values	Examples of building biology guide values in Germany	Lecture and presentation (Group of 25-28 students)	classroom / training room with access to the internet and with IWB	<ul style="list-style-type: none"> • Training material as a digital hand-out • PowerPoint Presentation 	Constant feedback from participants: Questions asked by lecturer during the lecture	5	
6	Evaluation	Checking the aims have been achieved	Lecture and presentation	classroom /training room with access to the internet and with IWB	Digital Test (forms)	Checking the knowledge test Evaluation questionnaire	10	Summary of the theoretical part
IN TOTAL							90 min	

Learning Unit 2 - Thermal comfort - Introduction to thermal comfort

Lead: Vocational education centre of JEDU (FI)

Support - Project partners

Relevanz

The thermal comfort of buildings makes an important contribution to an efficient and performance-enhancing working and living environment.

TITLE: Thermal comfort – Introduction to thermal comfort

TARGET GROUP 1:

Apprentices

Trainees in all building trades / professions (level 4)

TARGET GROUP 2:

Foreman, master craftsmen in building construction (level 4)

Trainees, teachers, instructors (level 6)

THE WAY OF IMPLEMENTATION:

- Power point presentation
- Hand-outs
- Worksheets for students

PRE-REQUIREMENTS

The introductory requirements include the knowledge in the following areas:

- Basic knowledge about building physics
- Basic in building construction

LEARNING OBJECTIVES

Knowledge:

- Basic knowledge about thermal physics

Skills:

- Ability to understand how thermal comfort is formed and how a person experiences heat and cold.
- Understand the factors that cause thermal comfort
- Applying knowledge to real-world scenarios

Competence:

- *Understanding the importance of one's own choices in construction from the perspective of thermal comfort*
- *Understanding the need for healthy construction*

MAIN CONTENTS

- What is thermal comfort?
- Thermal comfort factors
- The thermal environment of the interior
- Case studies and practical considerations

METHODS

- Lecture and presentation
- On-live, On-line class

ENVIRONMENTS

- Classroom
- PC or tablet connected to internet

MEDIA & TOOLS

- Training material in a form of paper document
- PowerPoint presentation
- Interactive whiteboard
- Device connected to internet
- Videos
- Tools suitable for recreating the situation in reality

EVALUATION

- Assessment tools (on-line or on papers)
- Questionnaires

Duration of a learning unit: 45 Minutes

Time schedule of the learning unit 2, Introduction to thermal comfort

STEP	CONTENT	TEACHING AIMS	METHODS	TEACHING PLACE	TOOLS AND RESOURCES	ASSESSMENT	TIME [min]	COMMENTS
1	Introduction - What is thermal comfort?	<p>Understanding the concept of thermal comfort and its role.</p> <p>Overviewing of heat transfer mechanisms: conduction, convection & radiation.</p>	Lecture + presentation	<p>Classrooms</p> <p>Device with access to Internet</p>	<ul style="list-style-type: none"> • PowerPoint - presentation 	<p>Constant feedback from students:</p> <ul style="list-style-type: none"> • Questions asked by teacher during the lecture • Observing the students 	05	
2	Thermal comfort factors	<p>Overview of factors that affect thermal comfort: air temperature, air humidity, air movement/velocity, physical activity, clothing, length of stay, radiation temperature</p> <p>Understanding the role of these factors in thermal comfort.</p>	Lecture + presentation	<p>Classrooms</p> <p>Device with access to Internet</p>	<ul style="list-style-type: none"> • PowerPoint - presentation 	<p>Constant feedback from students:</p> <ul style="list-style-type: none"> • Questions asked by teacher during the lecture • Observing the students 	15	

3	The thermal environment of the interior	understanding of the most common sources of heat and cold in the interior of buildings	Lecture + presentation	Classrooms. Device with access to Internet	<ul style="list-style-type: none"> • PowerPoint - presentation 	Constant feedback from students: <ul style="list-style-type: none"> • Questions asked by teacher during the lecture, • Observing the students 	10	
4	Case studies and practical considerations	Knowledge of examples of real-world applications.	Lecture + presentation Individual work or in groups of (4-5 students)		<ul style="list-style-type: none"> • Training material as a paper hand-out 	<ul style="list-style-type: none"> • Questions asked by teacher during the lecture, • Observing the students • Discussion 	10	
5	Checking if the aims have been achieved	Check test				<ul style="list-style-type: none"> • Questions asked by teacher during the lecture, • Observing the students • Discussion 	5	The summary of the theoretical part
IN TOTAL							45 min	

Learning Unit 2.1 – Thermal comfort – Frost Protection

Lead by: Vocational education centre of JEDU

TITLE: Thermal comfort – Frost protection

TARGET GROUP 1:

Apprentices
Trainees in all building trades / professions (level 4)

TARGET GROUP 2:

Foreman, master craftsmen in building construction (level 4)
Trainees, teachers, instructors (level 6)

THE WAY OF IMPLEMENTATION:

- PowerPoint presentation
- Hand-outs
- Worksheets for students

PRE-REQUIREMENTS

The introductory requirements include the knowledge in the following areas:

- Basic knowledge about building physics
- Basic in building construction

LEARNING OBJECTIVES

Knowledge:

- Basic knowledge frost protection
- Basic of house construction and renovation

Skills:

- Ability to understand the meaning of frost protection
- the ability to understand why buildings and structures must be protected against frost
- Understand the operating methods of different frost protection methods
- Ability to recognize frost damage in buildings and structures and identify the cause.
- Applying knowledge to real-world scenarios

Competence:

- Understand the importance of one's own choices in construction from the perspective of frost protection

MAIN CONTENTS

- What is frost protection?
- Frost damage in buildings and structures.
- Frost protection methods
- Frost protection at the construction site

METHODS

- Lecture and presentation
- On-live, On-line class

ENVIRONMENTS

- Classroom
- PC or tablet connected to internet

MEDIA & TOOLS

- Training material in a form of paper document
- PowerPoint presentation
- Interactive whiteboard
- Device connected to internet
- Videos
- Tools suitable for recreating the situation in reality

EVALUATION

- Assessment tools (on-line or on papers)
- Questionnaires

Duration of a learning unit: 90 Minutes

Time schedule of the learning unit 2.1, Frost protection

STEP	CONTENT	TEACHING AIMS	METHODS	TEACHING PLACE	TOOLS AND RESOURCES	ASSESSMENT	TIME [min]	COMMENTS
1	Introduction - What is frost protection?	Understanding the concept of frost protection and its role.	Lecture + presentation	- Classrooms. - Device with access to Internet	• PowerPoint - presentation	Constant feedback from students: • Questions asked by teacher during the lecture, • Observing the students	10	
2	Frost damages in buildings and structures	Learns to notice damage and deformations caused by frost in buildings and their structures	Lecture + presentation	- Classrooms. - Device with access to Internet	• PowerPoint - presentation	Constant feedback from students: • Questions asked by teacher during the lecture, • Observing the students	15	
3	Frost protection methods	Recognizes the basic principles and methods of frost protection	Lecture + presentation	- Classrooms. - Device with access to Internet	• PowerPoint - presentation	Constant feedback from students: • Questions asked by teacher during the lecture, • Observing the students	15	

4	Frost protection at the construction site	Practical examples of frost protection at construction sites.	Lecture + presentation	- Classrooms. - Device with access to Internet	• PowerPoint - presentation		15	
5	Case studies and practical considerations	Knowledge of examples of real-world applications.	Lecture + presentation Individual work or in groups of (4-5 students)		Worksheets for students. Training material as a paper hand-out. Tutorial videos.	<ul style="list-style-type: none"> • Questions asked by teacher during the lecture, • Observing the students • Discussion 	20	
6	Checking if the aims have been achieved	Check test				<ul style="list-style-type: none"> • Checking the knowledge (test / Evaluation / questionnaire) 	15	The summary of the theoretical part
IN TOTAL							90 min	

Learning Unit 2.2 – Thermal Comfort – Airtightness in construction

DEVELOPED BY: Vocational education centre of JEDU

TITLE: Thermal comfort –Airtightness in construction

TARGET GROUP 1:

Apprentices
Trainees in all building trades / professions (level 4)

TARGET GROUP 2:

Foreman, master craftsmen in building construction (level 4)
Trainees, teachers, instructors (level 6)

THE WAY OF IMPLEMENTATION:

- PowerPoint presentation
- Hand-outs
- Worksheets for students

PRE-REQUIREMENTS

The introductory requirements include the knowledge in the following areas:

- Basic knowledge about building physics
- Basic in building construction

LEARNING OBJECTIVES

Knowledge:

- Basic knowledge about airtightness
- Basic of house construction and renovation

Skills:

- Ability to work responsibly on a construction site from the point of view of air tightness.
- Applying knowledge to real-world scenarios

Competence:

- Understand the importance of one's own choices in construction from the perspective of airtightness

MAIN CONTENTS

Introduction - Why airtightness matters?

Basics of structural airtightness

Airtightness measurements

Examples and practical exercises

METHODS

- Lecture and presentation
- On-live, On-line class

ENVIRONMENTS

- Classroom
- PC or tablet connected to internet

MEDIA & TOOLS

- Training material in a form of paper document
- PowerPoint presentation
- Interactive whiteboard
- Device connected to internet
- Videos
- Tools suitable for recreating the situation in reality

EVALUATION

- Assessment tools (on-line or on papers)
- Questionnaires

Duration of a learning unit: 90 Minutes

Time schedule of the learning unit 2.2, Airtightness in construction

STEP	CONTENT	TEACHING AIMS	METHODS	TEACHING PLACE	TOOLS AND RESOURCES	ASSESSMENT	TIME [min]	COMMENTS
1	Introduction - Why airtightness matters	<ul style="list-style-type: none"> Importance for building energy efficiency and occupant comfort. Understanding air leaks and moisture-related issues. 	Lecture + presentation	<ul style="list-style-type: none"> Classrooms. Device with access to Internet 	<ul style="list-style-type: none"> PowerPoint - presentation 	Constant feedback from students: <ul style="list-style-type: none"> Questions asked by teacher during the lecture, Observing the students 	10	
2	Basics of structural airtightness	<ul style="list-style-type: none"> Significance of airtightness in building envelopes, windows, doors, and penetrations. Identifying potential leakage points in structural joints. 	Lecture + presentation	<ul style="list-style-type: none"> Classrooms. Device with access to Internet 	<ul style="list-style-type: none"> PowerPoint - presentation 	Constant feedback from students: <ul style="list-style-type: none"> Questions asked by teacher during the lecture, Observing the students 	20	
3	Airtightness measurements	<ul style="list-style-type: none"> Principles of Air Tightness testing Standards and methods for assessing airtightness. Practical measurement 	Lecture + presentation	<ul style="list-style-type: none"> Classrooms. Device with access to Internet 	<ul style="list-style-type: none"> PowerPoint - presentation 	Constant feedback from students: <ul style="list-style-type: none"> Questions asked by teacher during the lecture, Observing the students 	20	

		techniques.						
4	Case studies and practical considerations	Knowledge of examples of real-world applications. Hands-on exercise for conducting an airtightness test.	Lecture + presentation Individual work or in groups of (4-5 students)		Worksheets for students. Training material as a paper hand-out. Tutorial videos.	<ul style="list-style-type: none"> • Questions asked by teacher during the lecture, • Observing the students • Discussion 	20	
5	Checking if the aims have been achieved	Check test				<ul style="list-style-type: none"> • Checking the knowledge test Evaluation questionnaire 	10	The summary of the theoretical part
IN TOTAL							90 min	

Learning Unit 2.3 – Thermal comfort – cold / thermal bridges

DEVELOPED BY: Zespół Szkół Budownictwa Nr1 w Poznaniu (ZSB1)

TITLE: Thermal comfort – cold / thermal bridges

TARGET GROUP 1:

- Students / Apprentices (Bricklayer, Plasterer) (level 3)
- Trainees in all building trades / professions (level 3)

TARGET GROUP 2:

- Students / Apprentices (Construction Technician) (level 4)
- Trainees in all building trades / professions (level 4)

TARGET GROUP 3:

- Foreman, master craftsmen in building construction (level 6)
- Trainers, teachers, instructors (level 6)

THE WAY OF IMPLEMENTATION:

- PowerPoint presentations
- Handouts
- Worksheets for students

PRE-REQUIREMENTS

The introductory requirements include the knowledge in the following areas:

- Basics of building construction
- Basic knowledge of the physical properties of construction materials

LEARNING OBJECTIVES

Knowledge:

- Knowledge of what is a cold / thermal bridge
- Knowledge of the types of cold / thermal bridges
- Knowledge of the causes of thermal bridges
- Knowledge of how to prevent thermal bridges
- Knowledge of how to eliminate thermal bridges

Skills:

- Ability to assess the technical condition of building structures at a basic level
- Ability to identify the locations of potential thermal bridges in the building
- Ability to identify equipment for thermal imaging tests

Competence:

- Understanding the consequences of thermal bridges in buildings
- Understanding the need to eliminate thermal bridges in buildings
- Understanding the need for healthy construction

MAIN CONTENTS

- a) Introduction to cold bridges
- b) Understanding of heat transfer
- c) Types and characteristics of cold bridges
- d) Impact on energy efficiency
- e) Recognizing cold bridges in buildings
- f) Ways to prevent and eliminate thermal bridges in buildings
- g) Examples of thermal imaging surveys

METHODS

- Lecture and presentation
- Discussion (questions and answers)

ENVIRONMENTS

- Classroom with access to the Internet and multimedia projector

MEDIA & TOOLS

- Training material in a form of paper documents,
- PowerPoint presentation,
- Computers with access to the Internet
- Videos concerning practical examples

EVALUATION

- work in groups,
- knowledge test,
- evaluation questionnaire.

Duration of a learning unit: 90 Minutes

Time schedule of the learning unit 2.3 Thermal comfort – cold / thermal bridges

STEP	CONTENT	TEACHING AIMS	METHODS	TEACHING PLACE	TOOLS AND RESOURCES	ASSESSMENT	TIME [min]	COMMENTS
1	Introduction to cold bridges	Developing a foundational understanding of what thermal bridges are in the context of construction and energy efficiency.	Lecture and presentation (Group of 25-28 students)	Classroom equipped in computers with the access to the internet and multimedia projector	Training material as a paper hand-out. PowerPoint presentation. Projector or interactive whiteboard.	Constant feedback from students: <ul style="list-style-type: none"> • Questions asked by teacher during the lecture, • Observing the students. 	5	
2	Heat transfer	Basics knowledge of conduction, convection, and radiation. Understanding the role of thermal conductivity in heat transfer.	Lecture and presentation (Group of 25-28 students)	Classroom equipped in computers with the access to the internet and multimedia projector	Training material as a paper hand-out. PowerPoint presentation. Projector or interactive whiteboard.	Constant feedback from students: <ul style="list-style-type: none"> • Questions asked by teacher during the lecture, • Observing the students. 	10	
3	Types and characteristics of cold bridges	Understanding the significance of cold bridges. Ability to distinguish types of cold bridges (geometric, material, linear, point, etc.). Knowledge of basic characteristics that make certain structures prone to thermal bridging.	Lecture and presentation (Group of 25-28 students)	Classroom equipped in computers with the access to the internet and multimedia projector	Training material as a paper hand-out. PowerPoint presentation. Projector or interactive whiteboard.	Constant feedback from students: <ul style="list-style-type: none"> • Questions asked by teacher during the lecture, • Observing the students. 	10	
4	Impact on energy efficiency	Knowledge of basics of energy efficiency in buildings. Understanding how cold bridges affect heating and cooling costs. Awareness of importance	Lecture and presentation (Group of 25-28 students)	Classroom equipped in computers with the access to the internet and multimedia projector	Training material as a paper hand-out. PowerPoint presentation. Projector or interactive whiteboard.	Constant feedback from students: <ul style="list-style-type: none"> • Questions asked by teacher during the lecture, • Observing the students. 	10	

		of addressing cold bridges in construction.				<ul style="list-style-type: none"> • Discussion. 		
5	Recognizing cold bridges in buildings	<p>Knowledge of common areas prone to cold bridges.</p> <p>Ability to recognize visual signs of potential issues.</p> <p>Ability to interpret the thermal imaging surveys.</p>		Classroom equipped in computers with the access to the internet and multimedia projector	<p>PowerPoint presentation.</p> <p>A film showing how to use thermal imaging camera for detecting thermal bridges.</p>	<p>Constant feedback from students:</p> <ul style="list-style-type: none"> • Questions asked by teacher during the lecture, • Observing the students, • Discussion. 	10	
6		<p>Identifying thermal bridging in architectural plans.</p> <p>Indicating ways to avoid and eliminate thermal bridges.</p>	Individual work or in groups of (4-5 students)		<p>Worksheets for students.</p> <p>Training material as a paper hand-out.</p>	Observing students' work.	20	Enabling students to access information online using mobile phones
7	Conclusion and summary	Consolidation and recap of key concepts.	Lecture and presentation (Group of 25-28 students)	Classroom equipped in computers with the access to the internet and multimedia projector	PowerPoint presentation.	Addressing students' queries and concerns	5	Summing up the lecture
8	Evaluation	Checking if the aims have been achieved	Students' presentations Discussion (questions and answers)	Classroom equipped in computers with the access to the internet and multimedia projector	Worksheets for students.	The assessment of individual statements.	15	The summary of work in groups
9		Checking if the aims have been achieved	Check test			Checking the knowledge test	5	The summary of the theoretical part
IN TOTAL							90 min	

Learning Unit 2.4 – Thermal comfort – thermal insulation materials

DEVELOPED BY: Zespół Szkół Budownictwa Nr1 w Poznaniu (ZSB1)

TITLE: Thermal comfort – thermal insulation materials

TARGET GROUP 1:

- Students / Apprentices (Bricklayer, Plasterer) (level 3)
- Trainees in all building trades / professions (level 3)

TARGET GROUP 2:

- Students / Apprentices (Construction Technician) (level 4)
- Trainees in all building trades / professions (level 4)

TARGET GROUP 3:

- Foreman, master craftsmen in building construction (level 6)
- Trainers, teachers, instructors (level 6)

THE WAY OF IMPLEMENTATION:

- PowerPoint presentations
- Handouts
- Worksheets for students
- Material samples

PRE-REQUIREMENTS

The introductory requirements include the knowledge in the following areas:

- Basics of building construction
- Basic knowledge of the physical properties of construction materials
- Basic knowledge of the effects of thermal comfort / discomfort on people
- Basic knowledge of heat-related terms

LEARNING OBJECTIVES

Knowledge:

- Definition of the thermal insulation
- Knowledge of basic heat transfer mechanisms
- Knowledge of the types of thermal insulation
- Knowledge of emerging trends in eco-friendly insulations
- Knowledge of building regulations and standard

Skills:

- Ability to identify and differentiate between different thermal insulation materials
- Ability to evaluate the suitability of different insulation materials for specific scenarios
- Recognizing environmental considerations in the selection of insulation materials
- Applying knowledge to real-world scenarios

Competence:

- Understanding the importance of thermal insulation in various applications
- Comprehending the basic principles governing the thermal conductivity of materials
- Understanding the need for healthy construction

MAIN CONTENTS

- a) Introduction to thermal insulation
- b) Basic principles of heat transfer
- c) Common thermal insulation materials
- d) Factors influencing material selection
- e) Environmental considerations
- f) Case studies and practical considerations

METHODS

- Lecture and presentation
- Discussion (questions and answers)

ENVIRONMENTS

- Classroom with access to the Internet and multimedia projector

MEDIA & TOOLS

- Training material in a form of paper documents,
- PowerPoint presentation,
- Computers with access to the Internet,
- Videos concerning practical examples.

EVALUATION

- knowledge test,
- evaluation questionnaire,
- group discussions to encourage peer learning.

Duration of a learning unit: 90 Minutes

Time schedule of the learning unit 2.4 Thermal comfort – thermal insulation materials

STEP	CONTENT	TEACHING AIMS	METHODS	TEACHING PLACE	TOOLS AND RESOURCES	ASSESSMENT	TIME [min]	COMMENTS
1	Introduction	Understanding the concept of thermal insulation and its role in minimizing heat transfer. Acquaintance with real-life applications of thermal insulation. Understanding the importance of energy efficiency in buildings and industries.	Lecture and presentation (Group of 25-28 students)	Classroom equipped in computers with the access to the internet and multimedia projector	Training material as a paper hand-out. PowerPoint presentation. Projector or interactive whiteboard.	Constant feedback from students: <ul style="list-style-type: none"> • Questions asked by teacher during the lecture, • Observing the students. 	5	
2	Basic principles of heat transfer	Overviewing of heat transfer mechanisms: conduction, convection, and radiation. Understanding the role of insulation in minimizing heat transfer.	Lecture and presentation (Group of 25-28 students)	Classroom equipped in computers with the access to the internet and multimedia projector	Training material as a paper hand-out. PowerPoint presentation. Projector or interactive whiteboard.	Constant feedback from students: <ul style="list-style-type: none"> • Questions asked by teacher during the lecture, • Observing the students. 	5	

3	Common thermal insulation materials	Ability to identify and differentiate between different thermal insulation materials.	Lecture and presentation (Group of 25-28 students)	Classroom equipped in computers with the access to the internet and multimedia projector	Training material as a paper hand-out. PowerPoint presentation. Projector or interactive whiteboard. Material samples.	Constant feedback from students: <ul style="list-style-type: none"> • Questions asked by teacher during the lecture, • Observing the students. 	20	
4	Factors influencing material selection	Understanding thermal conductivity and resistance. Ability to take density and thickness into consideration. Knowledge of the moisture resistance and durability.	Lecture and presentation (Group of 25-28 students)	Classroom equipped in computers with the access to the internet and multimedia projector	Training material as a paper hand-out. PowerPoint presentation. Projector or interactive whiteboard. Technical specifications.	Constant feedback from students: <ul style="list-style-type: none"> • Questions asked by teacher during the lecture, • Observing the students. • Discussion. 	5	
5	Environmental considerations	Understanding the need of sustainability of insulation materials. Knowledge of recyclability and environmental impact. Knowledge of emerging trends in eco-friendly insulation.	Lecture and presentation (Group of 25-28 students)	Classroom equipped in computers with the access to the internet and multimedia projector	PowerPoint presentation. Projector or interactive whiteboard. Technical specifications.	Constant feedback from students: <ul style="list-style-type: none"> • Questions asked by teacher during the lecture, • Observing the students, • Discussion. 	5	

6	Case studies and practical considerations	Knowledge of examples of real-world applications.	Lecture and presentation (Group of 25-28 students)	Classroom equipped in computers with the access to the internet and multimedia projector	Worksheets for students. Training material as a paper hand-out. Tutorial videos.	Constant feedback from students: <ul style="list-style-type: none"> • Questions asked by teacher during the lecture, • Observing the students, • Discussion. 	10	
7		Ability to selection of insulation materials based on specific scenarios. Understanding the importance of professional advice in insulation projects.	Individual work or in groups of (4-5 students)	Classroom equipped in computers with the access to the internet and multimedia projector	Worksheets for students. Training material as a paper hand-out.	Observing students' work. Addressing students' queries and concerns	20	Enabling students to access information online using mobile phones
8	Conclusion and summary	Consolidation and recap of key concepts. Open the floor for questions and discussion.	Lecture and presentation (Group of 25-28 students)	Classroom equipped in computers with the access to the internet and multimedia projector	PowerPoint presentation.	Addressing students' queries and concerns	5	Summing up the lecture
9	Evaluation	Checking if the aims have been achieved	Students' presentations. Discussion (questions and answers)	Classroom equipped in computers with the access to the internet and multimedia projector	Worksheets for students.	The assessment of individual statements.	10	The summary of work in groups

10		Checking if the aims have been achieved	Check test			Checking the knowledge test	5	The summary of the theoretical part
							IN TOTAL	90 min

Learning Unit 2.5 – Thermal comfort - correct installation of thermal insulation

DEVELOPED BY: Zespół Szkół Budownictwa Nr1 w Poznaniu (ZSB1)

TITLE: Thermal comfort – correct installation of thermal insulation

TARGET GROUP 1:

- Students / Apprentices (Bricklayer, Plasterer) (level 3)
- Trainees in all building trades / professions (level 3)

TARGET GROUP 2:

- Students / Apprentices (Construction Technician) (level 4)
- Trainees in all building trades / professions (level 4)

TARGET GROUP 3:

- Foreman, master craftsmen in building construction (level 6)
- Trainers, teachers, instructors (level 6)

THE WAY OF IMPLEMENTATION:

- Safety emphasis
- Printed installation guidelines
- Demonstration by instructor
- Guided hands-on practice
- Workstations with different materials
- Collaborative group projects

- Realistic mock-ups
- Use of actual construction materials
- Instructors or experts available to provide guidance and support throughout the practical session

PRE-REQUIREMENTS

The introductory requirements include the knowledge in the following areas:

- Basics of building construction
- Theoretical knowledge of thermal insulation materials properties
- Theoretical knowledge of proper thermal insulation installation
- Theoretical knowledge of thermal bridges

LEARNING OBJECTIVES

Knowledge:

- Knowledge of proper installation of thermal insulation

Skills:

- Hands-on experience in the correct installation of thermal insulation / practical skills

Competence:

Understanding the need of creating comfortable indoor environments

MAIN CONTENTS

- a) Introduction
- b) Types of insulation – overview

- c) Factors influencing material selection
- d) Pre-installation preparation
- e) Hands-on installation
- f) Recap and closing

METHODS

- Demonstration and observation
- Interactive workshops
- Discussion (feedback and reflection)

ENVIRONMENTS

- Vocational workshop / lab

MEDIA & TOOLS

- Training material in a form of paper documents,
- Protective gear
- Mock walls / ceilings
- Various insulation materials
- Utility tools
- Instructors or experts available to provide guidance and support throughout the practical session
- Whiteboard / flipchart, markers
- First-aid kit

EVALUATION

- practical assessments

Duration of a learning unit: 90 Minutes

Time schedule of the learning unit 2.5 Thermal comfort – correct installation of thermal insulation

STEP	CONTENT	TEACHING AIMS	METHODS	TEACHING PLACE	TOOLS AND RESOURCES	ASSESSMENT	TIME [min]	COMMENTS
1	Introduction and safety precautions	Understanding how proper insulation can improve energy efficiency and reduce heating and cooling costs. Understanding the need of safety precautions.	Demonstration and observation (Group of 10-12 students)	Vocational workshop / lab	Insulation materials and tools. White board / flipchart. First aid kit.	Constant feedback from students: <ul style="list-style-type: none"> • Questions asked by teacher during the lecture, • Observing the students. 	5	
2	Types of insulation	Overviewing of common insulation materials. Knowledge of the suitability of each material for different applications.	Demonstration and observation (Group of 10-12 students)	Vocational workshop / lab	Mock walls / ceilings. Insulation materials and tools. White board / flipchart.	Constant feedback from students: <ul style="list-style-type: none"> • Questions asked by teacher during the lecture, • Observing the students. 	10	

3	Pre-installation preparation	Understanding of the importance of proper measurement and planning. Knowledge of how to accurately measure and cut insulation materials. Ability to create airtight seals and close gaps.	Individual work or in groups of (3-4 students)	Vocational workshop / lab	Training material as a paper hand-out. Mock walls / ceilings. Insulation materials and tools. Protective gear. White board / flip-chart.	Constant feedback from students: <ul style="list-style-type: none"> • Questions asked by teacher • questions asked while performing the task, • Observing the students. 	15	
4	Hands-on installation	Ability to choose an insulation material for the specific partition. Skills to install an insulation material according to provided guidelines.	Individual work or in groups of (3-4 students)	Vocational workshop / lab	Training material as a paper hand-out. Mock walls / ceilings. Insulation materials and tools. Protective gear. White board / flip-chart.	Constant feedback from students: <ul style="list-style-type: none"> • Questions asked by teacher • questions asked while performing the task, • Observing the students. • Discussion. 	40	Enabling students to access information online using mobile phones

5	Troubleshooting and Q&A	Knowledge of common mistakes during insulation installation. Knowledge of how to avoid the mistakes during insulation installation.	Demonstration and discussion (Group of 10-12 students)	Vocational workshop / lab	Mock ups.	Discussion.	10	
6	Recap and closing	Understanding the importance of proper installation for long-term effectiveness. Knowledge of key points and best practices in thermal insulation installation.	Demonstration and discussion (Group of 10-12 students)	Vocational workshop / lab	Mock ups.	Discussion.	5	
7	Evaluation	Checking if the aims have been achieved.	Evaluation forms for students to self-assess and receive feedback from instructors and peers.	Vocational workshop / lab	Mock ups.	Assessment through hands-on performance Discussion (questions and answers). Assessment through active participation in	5	

			Checklists to assess students' performance during practical installations.			discussions, and the ability to ask relevant questions during the Q&A session.		
IN TOTAL							90 min	

Learning Unit 3 – Moisture Comfort

DEVELOPED BY: Scuola Costruzioni Vicenza Andrea Palladio

TITLE: Moisture comfort

TARGET GROUP 1:

Students / Apprentices (bricklayers, Plasterer) (Level 3)

TARGET GROUP 2:

Students / Apprentices (Construction Technician) (Level 4)

Trainees in all building trades / professions (Level 4)

TARGET GROUP 3:

Foreman, master craftsmen in building construction (Level 6)

Trainees, teachers, instructors (Level 6)

THE WAY OF IMPLEMENTATION:

- Power points presentation
- Hand-outs
- Worksheets for students
- Practical demonstration

PRE-REQUIREMENTS

The introductory requirements include the knowledge in the following areas:

- Basic knowledge in building construction
- Basic knowledge about building physics
- Basic knowledge of construction materials

LEARNING OBJECTIVES

Knowledge:

- Knowledge of physics
- Knowledge of thermodynamics
- Knowledge of thermodynamics, regarding relative humidity, partial pressure of water vapor, and thermodynamic cycles.
- Knowledge of heat exchange
- Basic knowledge of physics
- Knowledge of composition of the atmosphere and the parameters that influence air quality,
- Knowledge of fundamentals of meteorology
- Knowledge of concepts such as relative humidity, dew point, and temperature.
- Knowledge of basic concepts of human physiology
- Knowledge of plant engineering (optional, for advanced studies)
- Knowledge of the behaviour of building materials in relation to humidity

Skills:

- Ability to assess moisture problem condition
- Ability to identify location in which moisture could appear
- Ability to detect moisture problems
- Ability to solve moisture damage
- Ability to select appropriate building materials

Competence:

- Understanding how **to calculate absolute / relative humidity**, partial pressure of water vapor, and thermodynamic cycles, understanding of how these factors influence how we perceive comfort in an environment.
- Understanding dynamics of heat **exchange between bodies and external environment** to understand how humidity affects the perception of comfort.
- Learn **air quality** and how it is composed (presence of water vapor and the various types of gases that make up the air.)
- Understanding of how **comfort of humidity** is closely linked to the human perception of heat and cold. It is useful to know the mechanisms of the human body, such as thermoregulation, perspiration, and the sensation of heat and cold in relation to humidity.
- Understanding of how ventilation, air conditioning and humidity control systems work in indoor spaces.
- Ability to **interpret psychrometric charts to assess air conditions** in terms of temperature and humidity. Knowledge of how to read it and apply theoretical concepts to practical cases.
- Acquire aptitude for **environmental analysis** and experimentation, ability to collect experimental data (such as measuring humidity and temperature) and interpret it to assess comfort is a useful skill.

MAIN CONTENTS

1. Microclimate and thermal well-being
2. Thermal comfort regulations and indices
3. Measurement instrument and monitoring strategies
4. Technical-planning strategies to be adopted already in buildings construction and/or renovation.
5. Thermal bridge
6. Problems connected to the thermal bridge
7. How humidity is created
8. How to measure humidity
9. Humidity and related diseases
10. Formation of microorganisms within humid environments

METHODS

- Lecture and presentation
- On-line or Live class

ENVIRONMENTS

- Classroom
- PC or tablet connected to internet

MEDIA & TOOLS

- Training material in a form of paper document
- Power point presentation
- Interactive whiteboard
- Device connected to internet
- Videos
- Tools suitable for recreating the situation in reality

EVALUATION

- Assessment tools (on-line or on papers)
- Questionnaires

Duration of a learning unit: 180 Minutes

Time schedule of the learning unit 3 Moisture comfort

STEP	CONTENT	TEACHING AIMS	METHODS	TEACHING PLACE	TOOLS AND RESOURCES	ASSESSMENT	TIME [min]	COMMENTS
1	Microclimate and thermal well-being	Key concepts related to microclimates, thermal comfort, and how environmental conditions impact human well-being	Lecture + presentation Practical activities	<ul style="list-style-type: none"> • Classrooms. • Device with access to Internet 	<ul style="list-style-type: none"> • Power points presentation • Hand-outs • Worksheets for students 	<ul style="list-style-type: none"> • Constant feedbacks from participants • Assessment tools (on-line or on papers) • Questionnaires 	15	
2	Thermal comfort regulations and indices	Overview on standards and metrics used to assess and regulate indoor environmental conditions Regulation per country Energy Efficiency considerations	Lecture + presentation Practical activities	<ul style="list-style-type: none"> • Classrooms. • Device with access to Internet 	<ul style="list-style-type: none"> • Power points presentation • Hand-outs • Worksheets for students 	<ul style="list-style-type: none"> • Constant feedbacks from participants • Assessment tools (on-line or on papers) • Questionnaires 	20	
3	Measurement instrument and monitoring strategies	Key knowledge on measurement instruments and monitoring strategies in the context of environmental conditions, including thermal comfort, the focus is	Lecture + presentation Practical activities	<ul style="list-style-type: none"> • Classrooms. • Device with access to Internet • Application & tools 	<ul style="list-style-type: none"> • Power points presentation • Hand-outs • Worksheets for students 	<ul style="list-style-type: none"> • Constant feedbacks from participants • Assessment tools (on-line or on papers) • Questionnaires 	30	

		on the tools and methodologies used to assess and analyze various parameters.						
4	Technical-planning strategies to be adopted in buildings construction and/or renovation.	Imparting knowledge and skills related to the design and implementation respect to local climate + environment teach how to conduct site analysis how to select materials and understand the LCA	Lecture + presentation Practical activities	<ul style="list-style-type: none"> • Classrooms. • Device with access to Internet 	<ul style="list-style-type: none"> • Power points presentation • Hand-outs • Worksheets for students 	<ul style="list-style-type: none"> • Constant feedbacks from participants • Assessment tools (on-line or on papers) • Questionnaires 	25	
5	Thermal bridge	Overview on thermal bridges, building envelope and rate of heat transfer. to identify and assess them. Knowledge on how to mitigate the thermal weak points.	Lecture + presentation Practical activities	<ul style="list-style-type: none"> • Classrooms. • Device with access to Internet 	<ul style="list-style-type: none"> • Power points presentation • Hand-outs • Worksheets for students 	<ul style="list-style-type: none"> • Constant feedbacks from participants • Assessment tools (on-line or on papers) • Questionnaires 	20	
6	Problems connected to thermal bridges.	Overview on issues arising due to the presence of thermal bridges in building envelope	Lecture + presentation Practical activities	<ul style="list-style-type: none"> • Classrooms. • Device with access to Internet 	<ul style="list-style-type: none"> • Power points presentation • Hand-outs • Worksheets for students 	<ul style="list-style-type: none"> • Constant feedbacks from participants • Assessment tools (on-line or on papers) • Questionnaires 	10	

		Condensation and Moisture Issues Indoor Comfort Challenges:						
7	How humidity is created	Competences on the processes and factors involved in the formation and regulation of humidity in the atmosphere.	Lecture + presentation Practical activities	<ul style="list-style-type: none"> • Classrooms. • Device with access to Internet 	<ul style="list-style-type: none"> • Power points presentation • Hand-outs • Worksheets for students 	<ul style="list-style-type: none"> • Constant feedbacks from participants • Assessment tools (on-line or on papers) • Questionnaires 	15	
8	How to measure humidity	Knowledge on how to measure humidity, providing with an understanding of the methods and instruments used for quantifying humidity levels in the air.	Lecture + presentation Practical activities	<ul style="list-style-type: none"> • Classrooms. • Device with access to Internet • Application & tools 	<ul style="list-style-type: none"> • Power points presentation • Hand-outs • Worksheets for students • 	<ul style="list-style-type: none"> • Constant feedbacks from participants • Assessment tools (on-line or on papers) • Questionnaires 	30	
9	Humidity and related diseases	Imparting knowledge about humidity and its connection to health, let's understand the impact of humidity on human health and the potential development of related diseases.	Lecture + presentation Practical activities	<ul style="list-style-type: none"> • Classrooms. • Device with access to Internet 	<ul style="list-style-type: none"> • Power points presentation • Hand-outs • Worksheets for students • 	<ul style="list-style-type: none"> • Constant feedbacks from participants • Assessment tools (on-line or on papers) • Questionnaires 	15	
IN TOTAL							180 min	

Learning Unit 3.1 – Moisture comfort – Moisture sources

DEVELOPED BY: Vocational education centre of JEDU

TITLE: Moisture comfort – Moisture sources

TARGET GROUP 1:

Apprentices
Trainees in all building trades / professions (level 4)

TARGET GROUP 2:

Foreman, master craftsmen in building construction (level 4)
Trainees, teachers, instructors (level 6)

THE WAY OF IMPLEMENTATION:

- PowerPoint presentation
- Hand-outs
- Worksheets for students

PRE-REQUIREMENTS

The introductory requirements include the knowledge in the following areas:

- Basic knowledge about building physics
- Basic in building construction

LEARNING OBJECTIVES

Knowledge:

- Basic knowledge about moisture physics
- Basic of house construction and renovation

Skills:

- Ability to understand the sources of moisture in house construction that can cause problems.

Competence:

- Understand the importance of one's own choices in construction from the perspective of moisture

MAIN CONTENTS

- Moisture sources

METHODS

- Lecture and presentation
- On-live, On-line class

ENVIRONMENTS

- Classroom
- PC or tablet connected to internet

MEDIA & TOOLS

- Training material in a form of paper document
- PowerPoint presentation
- Interactive whiteboard
- Device connected to internet
- Videos
- Tools suitable for recreating the situation in reality

EVALUATION

- Assessment tools (on-line or on papers)
- Questionnaires

Duration of a learning unit: 90 Minutes

Time schedule of the learning unit 3.1, Moisture sources

STEP	CONTENT	TEACHING AIMS	METHODS	TEACHING PLACE	TOOLS AND RESOURCES	ASSESSMENT	TIME [min]	COMMENTS
1	Moisture sources	helps to understand which sources of moisture are harmful to buildings and how to prevent them.	Lecture + presentation	- Classrooms. - Device with access to Internet	<ul style="list-style-type: none"> PowerPoint - presentation 	Constant feedback from students: <ul style="list-style-type: none"> Questions asked by teacher during the lecture, Observing the students 	45	
2		Students prepare a presentation individually or in pairs on one of the topics of the lecture. The teacher divides the subject areas. Teacher can give helping questions regarding the subject area	Individual work or in groups		<ul style="list-style-type: none"> Training material as a paper hand-out 	Observing the students	15	
3		Students' presentations are presented and discussed together.	Student presentations Discussion (question				15	The summary of individual work or in groups

			and answers)					
4	Checking if the aims have been achieved	Check test	Lecture + presentation Practical activities			<ul style="list-style-type: none"> • Checking the knowledge (test / Evaluation /questionnaire) 	15	The summary of the theoretical part
IN TOTAL							90 min	

Learning Unit 3.2 - Moisture comfort - moisture damages in different materials

DEVELOPED BY: Vocational education centre of JEDU

TITLE: Moisture comfort – moisture damages in different materials

TARGET GROUP 1:

Apprentices
Trainees in all building trades / professions (level 4)

TARGET GROUP 2:

Foreman, master craftsmen in building construction (level 4)
Trainees, teachers, instructors (level 6)

THE WAY OF IMPLEMENTATION:

- PowerPoint presentation
- Hand-outs
- Worksheets for students

PRE-REQUIREMENTS

The introductory requirements include the knowledge in the following areas:

- Basic knowledge about building physics
- Basic in building construction

LEARNING OBJECTIVES

Knowledge:

- Basic knowledge about moisture physics
- Basic of house construction and renovation

Skills:

- Ability to recognize moisture damage in building materials and structures and identify the cause.

Competence:

- Understand the importance of one's own choices in construction from the perspective of moisture

MAIN CONTENTS

- Moisture damages in different materials

METHODS

- Lecture and presentation
- On-live, On-line class

ENVIRONMENTS

- Classroom
- PC or tablet connected to internet

MEDIA & TOOLS

- Training material in a form of paper document
- PowerPoint presentation

- Interactive whiteboard
- Device connected to internet
- Videos
- Tools suitable for recreating the situation in reality

EVALUATION

- Assessment tools (on-line or on papers)
- Questionnaires

Duration of a learning unit: 90 Minutes

Time schedule of the learning unit 3.2, Moisture damages in different materials

STEP	CONTENT	TEACHING AIMS	METHODS	TEACHING PLACE	TOOLS AND RESOURCES	ASSESSMENT	TIME [min]	COMMENTS
1	Moisture damages in different materials	helps to identify moisture damage in different building materials and structures. To understand what causes them and how they can be prevented.	Lecture + presentation	- Classrooms. - Device with access to Internet	• PowerPoint - presentation	Constant feedback from students: <ul style="list-style-type: none"> • Questions asked by teacher during the lecture, • Observing the students 	45	
2		Students prepare a presentation individually or in pairs on one of the topics of the lecture. The teacher divides the subject areas. Teacher can give helping questions regarding the subject area	Individual work or in groups		• Training material as a paper hand-out	Observing the students	15	
3		Students' presentations are presented and discussed together.	Students' presentations Discussion (questions and answers)				15	The summary of individual work or in groups

4	Checking if the aims have been achieved	Check test	Lecture + presentation Practical activities			<ul style="list-style-type: none"> Checking the knowledge (test / Evaluation / questionnaire) 	15	The summary of the theoretical part
IN TOTAL							90 min	

Learning Unit 3.3 - Moisture comfort - responsible working to avoid moisture damage

DEVELOPED BY: Vocational education centre of JEDU

TITLE: Moisture comfort – Responsible working to avoid moisture damage

TARGET GROUP 1:

Apprentices
Trainees in all building trades / professions (level 4)

TARGET GROUP 2:

Foreman, master craftsmen in building construction (level 4)
Trainees, teachers, instructors (level 6)

THE WAY OF IMPLEMENTATION:

- PowerPoint presentation
- Hand-outs
- Worksheets for students

PRE-REQUIREMENTS

The introductory requirements include the knowledge in the following areas:

- Basic knowledge about building physics
- Basic in building construction

LEARNING OBJECTIVES

Knowledge:

- Basic knowledge about moisture physics
- Basic of house construction and renovation

Skills:

- Ability to work responsibly on a construction site from the point of view of moisture management and occupational safety.

Competence:

- Understand the importance of one's own choices in construction from the perspective of moisture

MAIN CONTENTS

- Moisture damages in different materials

METHODS

- Lecture and presentation
- On-live, On-line class

ENVIRONMENTS

- Classroom
- PC or tablet connected to internet

MEDIA & TOOLS

- Training material in a form of paper document
- PowerPoint presentation
- Interactive whiteboard
- Device connected to internet
- Videos
- Tools suitable for recreating the situation in reality

EVALUATION

- Assessment tools (on-line or on papers)
- Questionnaires

Duration of a learning unit: 90 Minutes

Time schedule of the learning unit 3.3, Moisture damages in different materials

STEP	CONTENT	TEACHING AIMS	METHODS	TEACHING PLACE	TOOLS AND RESOURCES	ASSESSMENT	TIME [min]	COMMENTS
1	Responsible working to avoid moisture damages	Learns to work responsibly and safely on construction/renovation sites. Understands the importance of operations during planning and construction from the perspective of moisture.	Lecture + presentation	- Classrooms. - Device with access to Internet	• PowerPoint - presentation	Constant feedback from students: <ul style="list-style-type: none"> • Questions asked by teacher during the lecture, • Observing the students 	45	
2		Students prepare a presentation individually or in pairs on one of the topics of the lecture. The teacher divides the subject areas. Teacher can give helping questions regarding the subject area	Individual work or in groups		• Training material as a paper hand-out	Observing the students	15	

3		Students' presentations are presented and discussed together.	Students' presentations Discussion (questions and answers)				15	The summary of individual work or in groups
4	Checking if the aims have been achieved	Check test	Lecture + presentation Practical activities			<ul style="list-style-type: none"> Checking the knowledge (test / Evaluation / questionnaire) 	15	The summary of the theoretical part
IN TOTAL							90 min	

Learning Unit 4 – Environmental Protection – Green Buildings

DEVELOPED BY: Kompetenzzentrum für Nachhaltiges Bauen Cottbus (BFW-BB)

TITLE: Environmental protection – Green buildings

TARGET GROUP 1:

- Apprentices,
- trainees in all building trades /professions (level 4)

TARGET GROUP 2:

- Foreman, master craftsmen in building construction (level 6)
- Trainers, teachers, instructors (level 6)

THE WAY OF IMPLEMENTATION:

- Power Point Presentations
- Hand-outs
- Worksheets for students
- Video film

PRE-REQUIREMENTS

The introductory requirements include the knowledge in the following areas:

- Basic knowledge about building physics
- Basics in building construction / finishing

LEARNING OBJECTIVES

Knowledge:

- What is a sustainable / green building
- which materials can be reused
- impact of environmental protection on building materials

Skills:

Ability to assess the environmental impact of building materials

Ability to apply knowledge of sustainable materials in practical construction scenarios

Ability to solve problems using sustainable materials solutions

Competence:

- participant can assess the influence of building physics parameters on healthy living
- they know the difference between green building and sustainable building
- understands the importance of ecology
- I feel responsible for environmental protection
- Understands the need to choose human/ environmentally friendly building material

MAIN CONTENTS

- a) Green building
- b) Sustainable building
- c) Environmental impact of building material
- d) Lifecycle of building materials
- e) footprint CO² and passport of building materials
- f) practical examples for the implementation of healthy building

METHODS

- Lecture and presentation
- discussion (questions and answers)
- short videos

ENVIRONMENTS

- Classroom with access to the Internet
- Set of tablets; one for each participant

MEDIA & TOOLS

- Training material in a form of paper documents,
- Power point presentation,
- interactive white board
- computers with access to the Internet
- video about the practical examples

EVALUATION

- knowledge test,
- evaluation questionnaire

Duration of a learning unit: 90 Minutes

Time schedule of the learning unit 4 Environmental protection – Green buildings

STEP	CONTENT	TEACHING AIMS	METHODS	TEACHING PLACE	TOOLS AND RESOURCES	ASSESSMENT	TIME [min]	COMMENTS
1	Green building	Understanding <ul style="list-style-type: none"> • What is a green building • Green building program EU 	Lecture and presentation (Group of 25-28 students)	classroom /training room with the access to the internet and with IWB	<ul style="list-style-type: none"> • Training material as a digital hand-out • PowerPoint Presentation • Interactive whiteboard 	Constant feedback from participants: <ul style="list-style-type: none"> • Questions asked by lecturer during the lecture 	10	
2	Sustainable building	Understanding <ul style="list-style-type: none"> • What is a sustainable building • Three pillars of sustainable buildings • Guide for sustainable building • Sustainable building quality certificate 	Lecture and presentation (Group of 25-28 students)	classroom /training room with the access to the internet and with IWB	<ul style="list-style-type: none"> • Training material as a digital hand-out • PowerPoint Presentation • Interactive whiteboard 	Constant feedback from participants: <ul style="list-style-type: none"> • Questions asked by lecturer during the lecture 	20	
3	Environmental impact of building materials	Lifecycle <ul style="list-style-type: none"> • The three life phases of a building • Lifetime of building materials and 	Lecture and presentation (Group of 25-28 students)	classroom /training room with the access to	<ul style="list-style-type: none"> • Training material as a digital hand-out 	Constant feedback from participants: <ul style="list-style-type: none"> • Questions asked by lecturer 	20	

		<p>components</p> <hr/> <p>Footprint CO²/passport</p> <ul style="list-style-type: none"> • Calculation of footprint (3 steps) • (Material passport) 		the internet and with IWB	<ul style="list-style-type: none"> • PowerPoint Presentation • Interactive whiteboard 	during the lecture			
4	Practical examples	<p>Examples</p> <ul style="list-style-type: none"> • Bio waste water treatment plant • Wall insulation with sheep wool • photovoltaics • use of renewable raw material 	Demonstrations / Showing of building component models	Komzet Cottbus – trainings centre for sustainable construction	Walking tour of the competence centre in Cottbus	Constant feedback from participants: <ul style="list-style-type: none"> • Questions asked by lecturer during the lecture 	30		
				Classroom / trainings room	Digital tour of the competence centre in Cottbus				
6	Evaluation	Checking the aims have been achieved	Lecture and presentation	classroom /training room with the access to the internet and with IWB	Digital Test (forms)	Checking the knowledge test Evaluation questionnaire	10	Summary of the theoretical part	
IN TOTAL							90 min		

Learning Unit 5 – Usage of healthy materials in buildings

DEVELOPED BY: Zespół Szkół Budownictwa Nr1 w Poznaniu (ZSB1)

TITLE: Usage of healthy materials in buildings

TARGET GROUP 1:

- Students / Apprentices in environmentally-focused building trades (e.g., Sustainable Construction, Green Building Techniques) (level 3)
- Trainees in all building trades / professions with a focus on eco-friendly practices (level 3)

TARGET GROUP 2:

- Students / Apprentices in advanced construction programs (e.g., Environmental Design, Sustainable Architecture) (level 4)
- Trainees in all building trades / professions with a specialization in sustainable building materials (level 4)

TARGET GROUP 3:

- Professionals in building construction with a focus on sustainable practices (e.g., Green Building Certified Professionals, LEED Accredited Professionals) (level 6)
- Educators, trainers, and instructors specializing in sustainable construction and architecture (level 6)

THE WAY OF IMPLEMENTATION:

- PowerPoint presentations
- Handouts
- Worksheets for students
- Material samples

PRE-REQUIREMENTS

The introductory requirements include the knowledge in the following areas:

- Basics of building construction
- Basic knowledge of the physical properties of construction materials
- Basic knowledge of sustainable building practices
- Basic knowledge of common building materials and their impact
- Basic knowledge of indoor environmental quality (IEQ)
- Basic knowledge of eco-friendly material selection
- Basic knowledge of life-cycle assessment (LCA)
- Basic knowledge of how carbon footprints affect building materials.

LEARNING OBJECTIVES

Knowledge:

- Definition of healthy building materials
- Knowledge of the types and properties of healthy building materials
- Knowledge of the environmental and health impacts of various construction materials, especially in relation to radiation
- Knowledge of sustainable building practices and green certifications
- Knowledge of building regulations and standards related to healthy materials
- Knowledge of the product passport
- Knowledge of Cradle-to-cradle production process

Skills:

- Ability to identify and select healthy building materials
- Ability to assess the environmental and health impact of building materials
- Ability to apply knowledge of healthy materials in practical construction scenarios
- Ability to solve problems using sustainable and healthy material solutions

Competence:

- Understanding the importance of healthy materials in construction
- Comprehending the role of material choices in environmental and health sustainability
- Understanding and adapting to emerging trends in healthy building materials
- Understanding the need for healthy construction

MAIN CONTENTS

- a) Introduction to healthy building materials
- b) Types of healthy building materials
- c) Health and environmental impacts of building materials
- d) Principles of material selection for healthy buildings
- e) Regulatory framework and standards for healthy materials
- f) Case studies in healthy building practices
- g) Innovations and future trends in healthy building materials

METHODS

- Lecture and presentation
- Discussion (questions and answers)
- Group activities and interactive exercises
- Case study analysis
- Hands-on demonstrations with material samples

ENVIRONMENTS

- Classroom with access to the Internet and multimedia projector

MEDIA & TOOLS

- Training material in a form of paper documents,
- PowerPoint presentation,
- Computers with access to the Internet,
- Videos concerning practical examples.

EVALUATION

- knowledge test,
- evaluation questionnaire,
- group discussions to encourage peer learning.

Duration of a learning unit: 180 Minutes

Time schedule of the learning unit 5 - Usage of healthy materials in building

STEP	CONTENT	TEACHING AIMS	METHODS	TEACHING PLACE	TOOLS AND RESOURCES	ASSESSMENT	TIME [min]	COMMENTS
1	Introduction to healthy materials	Understanding the concept of healthy building materials and their significance in construction.	Lecture and presentation (Group of 25-28 students)	Classroom equipped with computers, internet access, and multimedia projector	Training material as a paper hand-out. PowerPoint presentation. Projector or inter- active whiteboard	Constant feedback from students: <ul style="list-style-type: none"> • Questions asked by teacher during the lecture, • Observing the students. 	15	
2	Types of healthy materials	Overview of various healthy building materials and their properties.	Lecture and presentation (Group of 25-28 students)	Classroom equipped in computers with the access to the internet and multimedia projector	Training material as a paper hand-out. PowerPoint presentation. Projector or inter- active whiteboard.	Constant feedback from students: <ul style="list-style-type: none"> • Questions asked by teacher during the lecture, • Observing the students. 	20	
3	Health and environmental impact	Understanding the impact of building materials on human health and the environment.	Lecture and presentation (Group of 25-28 students)	Classroom equipped in computers with the access to the internet and multimedia projector	Training material as a paper hand-out. PowerPoint presentation. Projector or inter- active whiteboard.	Constant feedback from students: <ul style="list-style-type: none"> • Questions asked by teacher during the lecture, • Observing the students. 	25	

4	Material selection principles	Criteria for selecting healthy materials based on various factors.	Lecture and presentation (Group of 25-28 students)	Classroom equipped in computers with the access to the internet and multimedia projector	Training material as a paper hand-out. PowerPoint presentation. Projector or interactive whiteboard.	Constant feedback from students: <ul style="list-style-type: none"> • Questions asked by teacher during the lecture, • Observing the students. • Discussion. 	30	
5	Regulatory framework	Overview of standards and regulations related to healthy building materials.		Classroom equipped in computers with the access to the internet and multimedia projector	PowerPoint presentation. Training material as a paper hand-out.	Constant feedback from students: <ul style="list-style-type: none"> • Questions asked by teacher during the lecture, • Observing the students, • Discussion. 	20	
6	Case studies	Analysis of real-world applications and projects using healthy materials. Selection of healthy materials based on specific scenarios. Discussion on the importance of professional advice in healthy projects.	Individual work or in groups of (4-5 students)		Worksheets for students. Training material as a paper hand-out.	Observing students' work.	40	Encouraging practical application of knowledge. Enabling students to access information online using mobile phones

7	Conclusion and summary	Consolidation and recap of key concepts. Open the floor for questions and discussion.	Lecture and presentation (Group of 25-28 students)	Classroom equipped in computers with the access to the internet and multimedia projector	PowerPoint presentation.	Addressing students' queries and concerns	10	Summing up the lecture
8	Evaluation Knowledge test	Checking if the aims have been achieved	Students' presentations. Discussion (questions and answers)	Classroom equipped in computers with the access to the internet and multimedia projector	Worksheets for students. Knowledge test papers.	The assessment of individual statements.	15	The summary of work in groups. Review and feedback on learning.
9		Checking the comprehensive understanding of the topic.	Check test			Checking the knowledge test	5	The summary of the theoretical part
IN TOTAL							180 min	

Learning Unit 6 – Safety of building process

DEVELOPED BY: *Zespół Szkół Budownictwa Nr1 w Poznaniu (ZSB1)*

TITLE: *Safety of building process*

TARGET GROUP 1:

- Students / Apprentices (Bricklayer, Plasterer) (level 3)
- Trainees in all building trades / professions (level 3)

TARGET GROUP 2:

- Students / Apprentices (Construction Technician) (level 4)
- Trainees in all building trades / professions (level 4)

TARGET GROUP 3:

- Foreman, master craftsmen in building construction (level 6)
- Trainers, teachers, instructors (level 6)

THE WAY OF IMPLEMENTATION:

- PowerPoint presentations
- Handouts
- Worksheets for students
- Practical demonstration

PRE-REQUIREMENTS

The introductory requirements include the knowledge in the following areas:

- Basic understanding of construction processes, terminology, and foundational safety concepts
- Familiarity with construction site environments, tools, and equipment
- Sufficient language skills to comprehend safety instructions, signs, and communication on the construction site

LEARNING OBJECTIVES

Knowledge:

- Comprehension of fundamental safety principles applicable to construction sites
- Knowledge of common construction hazards
- Knowledge of emergency procedures
- Knowledge of relevant legal requirements and regulations
- Knowledge of risk assessment techniques

Skills:

- Ability to identify safety hazards, risk factors, and preventive measures
- Ability to assess risks and prioritize safety measures
- Ability to handle tools, equipment and materials properly
- Ability to wear and use PPE properly
- Ability to interpret safety documentation

Competence:

- Applying safety protocols to minimize risks
- Awareness of potential dangers
- Following safety protocols in real-world scenarios

MAIN CONTENTS

- a) Introduction to construction site safety
- b) Common hazards and risks
- c) Safety procedures and protocols
- d) Practical demonstration
- e) Examples of good/bad practices

METHODS

- Lecture and presentation
- Practical use of PPE
- Discussion (questions and answers)

ENVIRONMENTS

- Classroom with access to the Internet and multimedia projector

MEDIA & TOOLS

- Projector or whiteboard for presentations,
- Safety posters or visual aids,
- Sample of personal protective equipment (PPE) (hard hats, vests, gloves),
- PowerPoint presentation,
- Computers with access to the Internet
- Videos/photos concerning practical examples of good/bad practices

EVALUATION

- work in groups,
- knowledge test,
- evaluation questionnaire.

Duration of a learning unit: 180 Minutes

Time schedule of the learning unit 6 Safety of building process

STEP	CONTENT	TEACHING AIMS	METHODS	TEACHING PLACE	TOOLS AND RESOURCES	ASSESSMENT	TIME [min]	COMMENTS
1	Introduction to construction site safety	Developing a foundational understanding of safety importance. Understanding the legal and ethical responsibilities.	Lecture and presentation (Group of 25-28 students)	Classroom equipped in computers with the access to the internet and multimedia projector	Training material as a paper hand-out. PowerPoint presentation. Projector or inter- active whiteboard.	Constant feedback from students: <ul style="list-style-type: none"> • Questions asked by teacher during the lecture, • Observing the students. 	15	
2	Common hazards and risks	Awareness of various hazards (e.g., falls, electrical, chemical). Ability of risk assessment using real-world scenarios.	Lecture and presentation (Group of 25-28 students)	Classroom equipped in computers with the access to the internet and multimedia projector	Training material as a paper hand-out. PowerPoint presentation. Videos/photos Projector or inter- active whiteboard.	Constant feedback from students: <ul style="list-style-type: none"> • Questions asked by teacher during the lecture, • Observing the students. 	40	
3	Safety procedures and protocols	Ability of selection of personal protective equipment (PPE). Ability of safe handling of materials, tools and machinery. Knowledge of best practices for minimizing risks.	Lecture and presentation (Group of 25-28 students)	Classroom equipped in computers with the access to the internet and multimedia projector	Training material as a paper hand-out. PowerPoint presentation. Videos/photos Projector or inter- active whiteboard.	Constant feedback from students: <ul style="list-style-type: none"> • Questions asked by teacher during the lecture, • Observing the students. 	45	

		Knowledge of emergency procedures (fire evacuation, first aid)						
4	Practical demonstration	Ability of proper usage of personal protective equipment (PPE). Fire evacuation procedures.	Individual work or in groups of (4-5 students)	Classroom equipped in computers with the access to the internet and multimedia projector	Personal protective equipment (PPE). PowerPoint presentation. Projector or interactive whiteboard.	Constant feedback from students: <ul style="list-style-type: none"> • Questions asked by teacher during the presentation, • Observing the students. • Discussion. 	45	
7	Conclusion and summary, Q&A	Consolidation and recap of key concepts.	Lecture and presentation (Group of 25-28 students)	Classroom equipped in computers with the access to the internet and multimedia projector	PowerPoint presentation. Personal protective equipment (PPE).	Addressing students' queries and concerns	15	Summing up the lecture
8	Evaluation	Checking if the aims have been achieved	Students' practical skills presentations. Discussion (questions and answers)	Classroom equipped in computers with the access to the internet and	Personal protective equipment (PPE). Worksheets for students.	The assessment of individual statements.	15	The summary of work in groups

9		Checking if the aims have been achieved	Check test	multimedia projector		Checking the knowledge test	5	The summary of the theoretical part
IN TOTAL								180 min

Evaluation of Learning Units & Lessons learned

The learning units were originally developed by all the project partners in close collaboration.

They then passed through a rigorous testing phase, during which students from each respective school were given lessons using the newly developed learning units. Students were also given tests to get a better understanding of their level of engagement as well as their comprehension of the topics at hand.

The resulting new insights were incorporated into the final learning units to maximize their effectiveness.

Moreover, the ideas of both students as well as teachers were used to create learning units that are engaging while also remaining informative for students.

We have learned that this inclusion of students and teachers in the creation of learning offers is very valuable, since they are the main parties involved in actually conveying and understanding this information.

Future curricula should be developed with this kind of collaboration in mind: students and teachers providing feedback on the learning offers, as well as VET institutions across the EU working together to find solutions that are applicable across countries.

Supplemental Material & Reading

Throughout the project, many supplemental materials were created in order to support teachers with the conveying of information to the students. These materials are not necessary for the learning units, but can be helpful in creating a learning atmosphere that speaks to a broader range of students.

Supplemental learning materials include:

- Learning videos of various depth in various topics
- PowerPoints for the visualisation of some aspects
- Brochures for quick learning on the go
- A scientific article
- Various sources of information for supplemental reading (for interested students)

While these materials are available to use for teachers, we strongly encourage teachers to create their own learning materials using the learning units.

This will not only allow the teacher to continue using their own, personal style of teaching, but it will also deepen his or her understanding of the topic at hand. Furthermore, some cultural learning differences across countries may mean that a very successfully used learning material in one country may not be received as well in another.