

VERTICAL PLANT LIFE



Vertical Gardening

Catalogue of Knowledge, Skills and Competences

VET module for students

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INTRODUCTION

This Catalogue of Knowledge, Skills and Competences is designed as a framework for a VET (Vocational Education and Training) module on 'Vertical Gardening', to teach students how to construct, install and maintain living walls as part of an open curriculum in formal educational programmes. Living walls are modular systems fixed to exterior or interior walls. They are also known as vertical greening systems, green walls and vertical gardens.

The Catalogue of Knowledge, Skills and Competences comprises a General Part, a Specific Part and an Implementation Plan:

- The general Part outlines the purpose, objectives, duration, target group, enrolment criteria and anticipated results of the VET module on 'Vertical Gardening'.
- The specific Part defines the informative objectives (knowledge), formative objectives (skills) and horizontal – generic competences for all four learning units of the VET module on 'Vertical Gardening'.

The objectives in VET programmes or elements of a qualification are expressed as learning outcomes in terms of knowledge, skills and competences to be acquired and mastered at a given reference level. One of the key virtues of focusing on knowledge, skills and competences is that these relate to learning outcomes or outputs, irrespective of the routes of acquisition involved, rather than on learning inputs¹.

In order to define the learning outcomes, the partners considered five broad headings during development of the Catalogue: (a) knowledge and understanding – mainly subject-based, (b) practice (applied knowledge and understanding), (c) generic cognitive skills, e.g. evaluation, critical analysis, (d) communication, numeracy and IT skills, and (e) autonomy, accountability and working with others².

- The implementation Plan provides a unified structure for the four learning units of the VET module on 'Vertical Gardening', with the content of each learning unit and the corresponding number of theoretical and practical hours, methodological and didactical process, material conditions, learning material and student's independent work.

This Catalogue of Knowledge, Skills and Competences should be used together with:

- Training Guide – Teachers' Manual that provides practical guidelines for teaching the VET module on 'Vertical Gardening'
- European Qualification Framework (EQF) Translator for the VET module on 'Vertical Gardening'

"The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein."

¹ Source: Typology of knowledge, skills and competences: clarification of the concept and prototype: Cedefop Reference series; 64 Luxembourg: Office for Official Publications of the European Communities, 2006

² Source: Typology of knowledge, skills and competences: clarification of the concept and prototype: Cedefop Reference series; 64 Luxembourg: Office for Official Publications of the European Communities, 2006

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1. GENERAL PART

1.1 PURPOSE

The concept of green architecture encourages the establishment of green spaces in urban areas, including vertical gardens in the form of interior and exterior living walls. Green spaces in urban areas have a significant potential to improve the quality of the environment and human health and well-being.

The purpose of the VET module on 'Vertical Gardening' is to ensure a professional approach to the installation and maintenance of living walls through adequate education and practical training.

The students will study the four learning units as part of a professional/formal horticulture programme and will gain knowledge about different types of vertical greening system, their construction and maintenance, and the importance of appropriate plant selection.

1.2 OBJECTIVES

Students will:

- understand the benefits and constraints of vertical greening in indoor and outdoor environments
- be able to identify a variety of plants suitable for vertical greening systems in interior and exterior environments
- understand the different types of vertical greening systems, their substrates and properties
- be aware of the health and safety issues involved in the installation and maintenance of vertical greening systems
- be able to create a simple planting plan for use in a living wall system
- be able to use equipment appropriate to the installation and maintenance of vertical greening systems
- be able to use appropriate means of communication in the implementation of individual tasks and troubleshooting
- develop creative thinking and technical and professional responsibilities in the workplace
- be able to integrate theoretical and practical knowledge
- develop information literacy and inclusion of a European dimension in the educational process

1.3 DURATION

The module includes 40 hours of teaching time.

1.4 TARGET GROUPS

Horticulture students

1.5 PRELIMINARY KNOWLEDGE REQUIRED – LIMITATION AND ENROLMENT CRITERIA

Competence level – basic prerequisite knowledge is required by the student, therefore the VET module on 'Vertical Gardening' cannot be taught in first year of study. Acquisition of competences – students must already have basic level of knowledge regarding plants etc.

Learning objectives include gaining basic knowledge at varying levels of difficulty. It is up to the teacher to decide which methods will be used and when the module will be executed, depending on the season, weather conditions and facilities.

- Students should have basic knowledge of plants, equal to EQF level 4
- Basic botany (plant morphology),
- Basic nomenclature (Latin names)
- Basic requirements for plant growth (light, air, warmth, water, substrate, nutrients etc.)
- Basic knowledge of mathematics (calculations, metric units, understanding of scale)

1.6 ANTICIPATED RESULTS

Students will be made aware of the importance of vertical greening in urban horticulture for improving interior and exterior microclimates and creating better living conditions.

Students will be able to install and maintain living walls in a professional manner.

1.7 WHO CAN TEACH THIS MODULE

Each learning unit is meant to be distinct and may be taught by different teachers.

- Landscapers/Landscape Architects
- Garden designers
- Horticulturists/Agronomists

1.8 MODULE’S LEARNING UNITS

The VET module on ‘Vertical Gardening’ comprises four learning units:

- Learning Unit 1 – Introduction to Vertical Greening Systems – 5 hours
- Learning Unit 2 – Installation of Vertical Greening Systems – 15 hours
- Learning Unit 3 – Plants for Vertical Greening Systems – 5 hours
- Learning Unit 4 – Maintenance of Vertical Greening Systems – 15 hours

LEARNING UNIT	COMPETENCE LEVEL	ACQUISITION OF COMPETENCES			EXAMINATION	HOURS
		BASIC LEVEL	ROUTINE LEVEL	ADVANCED LEVEL		
LU1: Introduction to vertical greening systems			x		Multiple choice questionnaire	5
LU2: Installation of vertical greening systems			x		Practical test Written/oral test	15
LU3: Plants for vertical greening systems	Basic botany requirements for plant growth		x	x	Practical test Written/oral test	5
LU4: Maintenance of vertical greening systems			x	x	Practical test Written/oral test	15

2. SPECIFIC PART AND IMPLEMENTATION PLAN – LEARNING UNITS

2.1 LEARNING UNIT 1: INTRODUCTION TO VERTICAL GREENING SYSTEMS

2.1.1 SPECIFIC PART

Learning Unit 1 INTRODUCTION TO VERTICAL GREENING SYSTEMS		
OBJECTIVES ³ : Learning outcomes – Knowledge Skills Competences		
INFORMATIVE OBJECTIVES Knowledge: theories, concepts, definitions	FORMATIVE OBJECTIVES Skills: procedures, working methods, what the individual is able to perform in a specific field	HORIZONTAL – GENERIC COMPETENCES Focuses on the development of professional attitude: critical thinking, learning to learn, responsibility, autonomy, social and civil competences, digital competences etc.
Student: - Understand the benefits of urban greening - Understand the historical development of vertical greening systems - Understand the difference between natural and artificial ecosystems - Understand the different types of vertical greening systems and their relative sustainability - Understand the different types of substrate and their appropriate use	Student: - Identify the benefits of urban greening - Outline the historical development of vertical greening - Identify the differences between natural and artificial ecosystems - Identify the different types of vertical greening systems - Identify the difference between media-based and hydroponic vertical greening systems	The content of the VPL module are horizontally connected to the contents of other modules of the curriculum. Students will already have gained knowledge about soil preparation, different types of substrate, and artificial ecosystems. In LU1, students will develop critical thinking about the benefits of plants in urban environments. Method of learning: (5 hours) Evaluation: - Multiple choice questionnaire Evaluation criteria: - 60% for grade E

³ The objectives in VET programmes or elements of a qualification are expressed as learning outcomes in terms of knowledge, skills and competences (Source: Typology of knowledge, skills and competences: clarification of the concept and prototype: Cedefop Reference series; 64 Luxembourg: Office for Official Publications of the European Communities, 2006).

2.1.2 IMPLEMENTATION PLAN

Learning Unit 1 INTRODUCTION TO VERTICAL GREENING SYSTEMS No. of hours: 5						
IMPLEMENTATION PLAN						
Learning unit content	Theoretical no. of hrs	Practical no. of hrs	Methodological, didactical process	Material conditions	Learning material	Learner's independent work
Presentation on the benefits of vertical greening (ecosystem services), its historical development, and the difference between natural and artificial ecosystems	3	0	Presentation Individual exercise	Classroom	PowerPoint presentation	Worksheet Written exercise
Demonstration of the different types of vertical greening systems and their relative durability	0	1	Demonstration	Classroom Living walls	Videos Samples of different vertical greening systems Living walls	Worksheet
Demonstration of the different types of substrate and their appropriate use	0	1	Demonstration	Classroom Living walls	Samples of different vertical greening systems Living walls	Worksheet

2.2 LEARNING UNIT 2: INSTALLATION OF VERTICAL GREENING SYSTEMS

2.2.1 SPECIFIC PART

Learning Unit 2 INSTALLATION OF VERTICAL GREENING SYSTEMS		
OBJECTIVES: Learning outcomes – Knowledge Skills Competences		
INFORMATIVE OBJECTIVES Knowledge: theories, concepts, definitions	FORMATIVE OBJECTIVES Skills: procedures, working methods, what the individual is able to perform in a specific field	HORIZONTAL – GENERIC COMPETENCES Focuses on the development of professional attitude: critical thinking, learning to learn, responsibility, autonomy, social and civil competences, digital competences etc.
<p>Student:</p> <ul style="list-style-type: none"> - Understand health and safety issues relating to the installation of vertical greening systems - Understand appropriate locations for vertical greening systems in interior and exterior environments - Understand methods of installation of different kinds of vertical greening system, including non-permeable membranes, irrigation and lighting systems, and sensors - Understand appropriate planting techniques relative to the different types of vertical greening systems - Understand appropriate techniques for water preparation including sterilization and fertigation 	<p>Student:</p> <ul style="list-style-type: none"> - Identify the health and safety issues relating to the installation of vertical greening systems - Identify appropriate locations for vertical greening systems in indoor and outdoor environments - Draw an annotated diagram of a vertical greening system (cross-section and short text description) <ul style="list-style-type: none"> - Install a simple living wall system - Install irrigation pipes - Install a lighting system - Install sensors - Describe appropriate planting techniques relative to the different types of vertical greening systems - Describe appropriate techniques for water preparation including sterilization and fertigation 	<p>The students will gain knowledge about the methods for installing different kinds of vertical greening system.</p> <p>Some knowledge about the technical requirements of plants (light, fertilizer, etc.) will already have been gained by the students during the first year of their studies.</p> <p>Students will develop critical thinking about the various practical skills needed for installing vertical greening systems, and responsibility in terms of health and safety issues. They will learn how to work effectively as part of a team in order to construct a simple living wall.</p> <p>Method of learning: (15 hours)</p> <p>Evaluation:</p> <ul style="list-style-type: none"> - Practical test - Written/oral test <p>Evaluation criteria:</p> <ul style="list-style-type: none"> - 60% for grade E

2.2.2 IMPLEMENTATION PLAN

Learning Unit 2 INSTALLATION OF VERTICAL GREENING SYSTEMS No. of hours: 15						
IMPLEMENTATION PLAN						
Learning unit content	Theoretical no. of hrs	Practical no. of hrs	Methodological, didactical process	Material conditions	Learning material	Learner's independent work
Presentation on health and safety regulations for working at height and appropriate locations for vertical greening systems in interior and exterior environments	2		Presentation Individual exercise	Classroom Living walls	PowerPoint presentation Living walls	Worksheet Written exercise
Demonstration of positioning and levelling		1	Demonstration Team exercise	Living walls	Living walls Materials Tools	Worksheet Practical exercise
Demonstration of the installation of substructure (non-permeable membranes, boards etc.)		1	Demonstration Team exercise	Living walls	Living walls Materials Tools	Worksheet Practical exercise
Demonstration of the installation of different types of superstructure (panels, textile layers, pots, boxes, troughs, pockets etc.)		3	Demonstration Team exercise	Living walls	Living walls Materials Tools	Worksheet Practical exercise
Demonstration of the installation of irrigation systems		2	Demonstration Team exercise	Living walls	Living walls Materials Tools	Worksheet Practical exercise
Demonstration of the installation of lighting systems		1	Demonstration Team exercise	Living walls	Living walls Materials Tools	Worksheet Practical exercise
Demonstration of the installation of sensors (switches, magnet valves, controls etc.)		1	Demonstration Team exercise	Living walls	Living walls Materials Tools	Worksheet Practical exercise
Demonstration of appropriate planting techniques		1	Demonstration Individual exercise	Living walls	Living walls Materials Tools	Worksheet Practical exercise

Demonstration of appropriate techniques for water preparation including sterilization and fertigation		3	Demonstration Team exercise	Living walls	Living walls Materials Tools	Worksheet Practical exercise
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2.3 LEARNING UNIT 3: PLANTS FOR VERTICAL GREENING SYSTEMS

2.3.1 SPECIFIC PART

Learning Unit 3 PLANTS FOR VERTICAL GREENING SYSTEMS		
OBJECTIVES: Learning outcomes – Knowledge Skills Competences		
INFORMATIVE OBJECTIVES Knowledge: theories, concepts, definitions	FORMATIVE OBJECTIVES Skills: procedures, working methods, what the individual is able to perform in a specific field	HORIZONTAL – GENERIC COMPETENCES Focuses on the development of professional attitude: critical thinking, learning to learn, responsibility, autonomy, social and civil competences, digital competences etc.
<p>Student:</p> <ul style="list-style-type: none"> - Understand suitable plant selection for interior and exterior vertical greening systems, including selection of appropriate pot sizes, duration of time to establishment, plants for shade vs plants for sun, deciduous vs evergreen - Understand plant hardiness zones and the hardiness ratings of plants suitable for vertical greening systems 	<p>Student:</p> <ul style="list-style-type: none"> - Identify plants for interior and exterior planting - Identify different plants for different sites (sunny, shade) - Prepare planting lists for different types of vertical greening system (Latin nomenclature and pot size) - Prepare planting lists for different indoor and outdoor situations (Latin nomenclature and pot size) 	<p>Students will have already gained knowledge about different types of plants from other modules of their curriculum.</p> <p>This module will upgrade their knowledge of botany, plant physiology and growing requirements.</p> <p>Students will develop critical thinking about the use of various plant species in vertical greening systems.</p> <p>Students will also develop a sense of responsibility about the effective use of plants.</p> <p>Method of learning: (5 hours)</p> <p>Evaluation:</p> <ul style="list-style-type: none"> - Practical test - Written/oral test <p>Evaluation criteria:</p> <ul style="list-style-type: none"> - 60% for grade E

2.3.2 IMPLEMENTATION PLAN

Learning Unit 3 PLANTS FOR VERTICAL GREENING SYSTEMS						
No. of hours: 5						
IMPLEMENTATION PLAN						
Learning unit content	Theoretical no. of hrs	Practical no. of hrs	Methodological, didactical process	Material conditions	Learning material	Learner's independent work
Presentation/ demonstration of the selection of suitable plants for indoor and outdoor vertical greening systems, including duration of time to establishment, plants for shade vs plants for sun, deciduous vs evergreen	0,5	0,5	Presentation Demonstration	Classroom Garden Nursery	PowerPoint presentation Database of ornamental plants Live plants	Worksheet
Presentation on plant hardiness zones and the hardiness ratings of plants suitable for vertical greening systems	0,5		Presentation	Classroom	Images of plants and their parts Map of hardiness zones	Worksheet
Demonstration of different pot sizes appropriate for different types of vertical greening system		0,5	Demonstration	Green house	Potted plants	Worksheet
Hands-on presentation of 40 plants appropriate for vertical greening systems		1	Demonstration	Garden Nursery Living walls	Live plants	Worksheet
Evaluation: Identify 40 plants appropriate for vertical greening systems (Latin nomenclature)		1	Individual exercise	Garden Nursery Living walls	Live plants	Practical exercise
Evaluation: Written/oral test (hypothetical scenario)	1		Individual exercise	Classroom	Graphic material	Written/oral exercise

2.4 LEARNING UNIT 4: MAINTENANCE OF VERTICAL GREENING SYSTEMS

2.4.1 SPECIFIC PART

Learning Unit 4 MAINTENANCE OF VERTICAL GREENING SYSTEMS		
OBJECTIVES: Learning outcomes – Knowledge Skills Competences		
INFORMATIVE OBJECTIVES Knowledge: theories, concepts, definitions	FORMATIVE OBJECTIVES Skills: procedures, working methods, what the individual is able to perform in a specific field	HORIZONTAL – GENERIC COMPETENCES Focuses on the development of professional attitude: critical thinking, learning to learn, responsibility, autonomy, social and civil competences, digital competences etc.
<p>Student:</p> <ul style="list-style-type: none"> - Understand the basic needs of plants and the causes of physiological stress - Understand common pests and diseases and other signs of stress (drought, moisture, cold, light, nutrients, etc.) - Understand appropriate treatments for pests and diseases - Understand the techniques of plant replacement - Understand pruning techniques - Understand the effect of seasonal variation relative to the maintenance of vertical greening systems (adjustment of light, irrigation etc.) - Understand how to check the integrity of the system (irrigation, lighting, controls etc.) and how to troubleshoot - Understand how to prepare a maintenance plan 	<p>Student:</p> <ul style="list-style-type: none"> - Identify the basic needs of plants and the causes of physiological stress - Identify common pests and diseases and other signs of plant stress - Apply treatments for pests and diseases - Replace plants - Prune plants - Describe the effect of seasonal variation relative to the maintenance of vertical greening systems - Describe how to check the integrity of the system (irrigation, lighting, controls etc.) and how to troubleshoot - Prepare a maintenance plan 	<p>Students will acquire knowledge about the maintenance of plants and vertical greening systems.</p> <p>Students will already have gained basic knowledge about the maintenance of plants from other modules in curriculum.</p> <p>Students will develop critical thinking about the maintenance of vertical greening systems, and a duty of care for living plants. They will learn how to work effectively as part of a team in order to solve problems.</p> <p>Method of learning: (15 hours) Evaluation: - Practical test - Written/oral test Evaluation criteria: - 60% for grade E</p>

2.4.2 IMPLEMENTATION PLAN

Learning Unit 4 MAINTENANCE OF VERTICAL GREENING SYSTEMS						
No. of hours: 15						
IMPLEMENTATION PLAN						
Learning unit content	Learning unit content	Learning unit content	Learning unit content	Learning unit content	Learning unit content	Learning unit content
Presentation/ demonstration of the symptoms and causes of plant stress and how to troubleshoot	1	1	Presentation Demonstration Team exercise	Classroom Green house	PowerPoint presentation Examples of unhealthy plants	Worksheet Practical exercise
Presentation/ demonstration of plant replacement in different types of vertical greening system	1	2	Presentation Demonstration Individual exercise	Classroom Living walls	PowerPoint presentation Living walls Potted plants	Worksheet Practical exercise
Presentation/ demonstration of pruning techniques on different types of plant	2	3	Presentation Demonstration Individual exercise	Classroom Living walls	PowerPoint presentation Living walls Tools	Worksheet Practical exercise
Presentation/ demonstration of the effect of seasonal variation on the maintenance of vertical greening systems	1	2	Presentation Demonstration Individual exercise	Classroom Living walls	PowerPoint presentation Living walls	Worksheet Written exercise
Demonstration of how to check the integrity of the system (irrigation, lighting, controls etc.) and how to troubleshoot		1	Demonstration Team exercise	Living walls	Living walls Tools	Worksheet Practical exercise
Presentation on how to prepare a maintenance plan	0,5	0,5	Presentation Individual exercise	Classroom	Maintenance plan Calendar	Worksheet Practical exercise

APPENDIX 1

European Qualification Framework (EQF) Translator for the ‘Vertical Gardening’ VET module

The Vertical Plant Life project is complemented by **EQF, the translation tool of qualifications**. This makes qualifications easier to understand in different EU countries. Three common European reference levels (3, 4 and 5) are described in the **EQF Translator for ‘Vertical Gardening’ VET module** in terms of learning **outcomes: knowledge, skills and competences**.

Training providers will determine the level of qualifications in their countries themselves.

The EQF Translator for ‘Vertical Gardening’ VET module should be read together with universal **EQF descriptors** (<http://ec.europa.eu/ploteus/content/descriptors-page>). It should not be treated in isolation. Consequently, the EQF Translator for ‘Vertical Gardening’ VET module only provides those learning outcomes which are specific to the VET module on ‘Vertical Gardening’. They relate to the four Learning Units: Introduction to vertical greening systems, Installation of vertical greening systems, Plants for vertical greening systems, and Maintenance of vertical greening systems. Learning units are embedded in the learning outcomes within the three categories of knowledge, skills and competences.

EQF descriptors should therefore be taken into account for each of the different EQF levels (3, 4 and 5).

The EQF Translator for ‘Vertical Gardening’ VET module does not cover the complete range of all possible learning outcomes that are needed in the field of living walls. What is crucial is a good balance between being specific enough and still general enough for the translator to capture the diversity of living wall qualifications and to be manageable.

The EQF Translator for the ‘Vertical Gardening’ VET module should be used together with the Catalogue of Knowledge, Skills and Competences for the VET module on ‘Vertical Gardening’.

3.1 EQF TRANSLATOR for 'Vertical Gardening' VET module – LEVEL 3

EQF descriptor LEVEL 3	Knowledge Knowledge of facts, principles, processes and general concepts, in a field of work or study	Skills A range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic methods, tools, materials and information	Competences Take responsibility for completion of tasks in work or study; adapt own behavior to circumstances in solving problems
Learning Unit 1 INTRODUCTION TO VERTICAL GREENING SYSTEMS			
	<ul style="list-style-type: none"> - Understand the general benefits of vertical greening, its historical development, and the difference between natural and artificial ecosystems 	<ul style="list-style-type: none"> - Explain the importance of benefits of vertical greening - Know and understands the historical development of living walls - Understand, know and distinguish between natural and artificial ecosystems 	<ul style="list-style-type: none"> - Apply knowledge of different plant communities and their importance in internal and external environments - Know how to distinguish between natural and artificial ecosystems - Know how to distinguish between the different types of vertical greening systems and their relative sustainability - Understand different types of substrate and their appropriate use
Learning Unit 2 INSTALLATION OF VERTICAL GREENING SYSTEMS			
	<ul style="list-style-type: none"> - Understand health and safety issues relating to the installation of vertical greening systems - Understand appropriate locations for vertical greening systems in interior and exterior environments - Understand the general principles of construction and installation of vertical greening systems, including non-permeable membranes, irrigation and lighting systems, and sensors - Understand appropriate planting techniques relative to the different types of vertical greening systems - Understand appropriate techniques for water preparation including sterilization and fertigation 	<ul style="list-style-type: none"> - Identify the health and safety issues relating to the installation of vertical greening systems - Identify appropriate locations for smaller (20m²) vertical greening systems in indoor and outdoor environments - Draw an annotated diagram of a vertical greening system (cross-section and short text description) <ul style="list-style-type: none"> - Install a simple living wall system - Install irrigation pipes - Install a lighting system - Install sensors - Describe appropriate planting techniques relative to the different types of vertical greening systems - Describe appropriate techniques for water preparation including sterilization and fertigation 	<p>The students gain basic knowledge on the technical aspects of vertical greening.</p> <p>Students will already have gained some knowledge on the technical requirements (lightning, fertilizing, etc.) in the first year of their course (horticulture, gardening, floristry etc.)</p> <p>Students understand the various practical skills needed for installing vertical greening systems and pertinent health and safety issues.</p> <p>They learn how to work effectively as part of a team and a duty of care for the plants.</p>

Learning Unit 3 PLANTS FOR VERTICAL GREENING SYSTEMS

	<ul style="list-style-type: none"> - Understand suitable plant selection for interior and exterior vertical greening systems, including selection of appropriate pot sizes, duration of time to establishment, plants for shade vs. plants for sun, deciduous vs. evergreen - Understand plant hardiness zones and the hardiness ratings of plants suitable for vertical greening systems 	<ul style="list-style-type: none"> - Identify plants for interior and exterior planting - Identify different plants for different sites (sunny, shade) - Prepare planting lists for different types of vertical greening system (Latin nomenclature and pot size) - Prepare planting lists for different indoor and outdoor situations (Latin nomenclature and pot size) 	<p>Students gain knowledge on plants, their specifications, needs, and basic botany.</p> <p>Students know how to care for the plants in a living wall.</p>
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Learning Unit 4 MAINTENANCE OF VERTICAL GREENING SYSTEMS

	<ul style="list-style-type: none"> - Understand the basic needs of plants and the causes of physiological stress - Understand common pests and diseases and other signs of stress (drought, moisture, cold, light, nutrients, etc.) - Understand appropriate treatments for pests and diseases - Understand the techniques of plant replacement - Understand pruning techniques - Understand the effect of seasonal variation on the maintenance of living walls (adjustment of light, irrigation etc.) - Understand how to check the integrity of the system (irrigation, lighting, controls etc.) and how to troubleshoot - Understand how to prepare a maintenance plan 	<ul style="list-style-type: none"> - Identify the basic needs of plants and the causes of physiological stress - Identify common pests and diseases and other signs of plant stress - Apply treatments for pests and diseases - Replace plants - Prune plants - Describe the effect of seasonal variation on the maintenance of vertical greening systems - Describe how to check the integrity of the system (irrigation, lighting, controls etc.) and how to troubleshoot - Being able to care for plants in smaller vertical plantings up to 20 square meters 	<p>Students gain knowledge of the use of plants, their growth and care requirements.</p> <p>Students will already have gained basic knowledge on the use of plants in other training programmes in the field of horticulture.</p>
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3.2 EQF TRANSLATOR for 'Vertical Gardening' VET module – LEVEL 4

EQF descriptor LEVEL 4	Knowledge Factual and theoretical knowledge in broad contexts within a field of work or study	Skills A range of cognitive and practical skills required to generate solutions to specific problems in a field of work or study	Competences Exercise self-management within the guidelines of work or study contexts that are usually predictable, but are subject to change; supervise the routine work of others, taking some responsibility for the evaluation and improvement of work or study activities
Learning Unit 1 INTRODUCTION TO VERTICAL GREENING SYSTEMS			
	<ul style="list-style-type: none"> - Understand the benefits of vertical greening - Understand the historical development of vertical greening - Understand the difference between natural and artificial ecosystems - Understand the different types of vertical greening systems and their relative sustainability - Understand the different types of substrate and their appropriate use 	<ul style="list-style-type: none"> - Identify the benefits of vertical greening - Outline the historical development of vertical greening - Identify the differences between natural and artificial ecosystems - Identify the different types of vertical greening systems - Identify the difference between media-based and hydroponic vertical greening systems 	Students gain critical thinking about the benefits of plants in urban environments.
Learning Unit 2 INSTALLATION OF VERTICAL GREENING SYSTEMS			
	<ul style="list-style-type: none"> - Understand health and safety issues relating to the installation of vertical greening systems - Understand appropriate locations for vertical greening systems in interior and exterior environments - Understand general principles for the construction and installation of vertical greening systems including non-permeable membranes, irrigation and lighting systems, and sensors - Understand appropriate planting techniques relative to the different types of vertical greening systems - Understand appropriate techniques for water preparation including sterilization and fertigation 	<ul style="list-style-type: none"> - Identify the health and safety issues relating to the installation of vertical greening systems - Identify appropriate locations for smaller (20m²) vertical greening systems in indoor and outdoor environments - Draw an annotated diagram of a vertical greening system (cross-section and short text description) - Describe appropriate planting techniques relative to the different types of vertical greening systems - Describe appropriate techniques for water preparation 	Students get basic knowledge on technical ways of vertical greening. Students understand the various practical skills needed for installing vertical greening systems and health and safety issues. They learn how to work effectively as part of a team in order to construct a simple living wall.

Learning Unit 3 PLANTS FOR VERTICAL GREENING SYSTEMS

	<ul style="list-style-type: none"> - Understand suitable plant selection for interior and exterior vertical greening systems, including selection of appropriate pot sizes, duration of time to establishment, plants for shade vs. plants for sun, deciduous vs. evergreen - Understand plant hardiness zones and the hardiness ratings of plants suitable for vertical greening systems 	<ul style="list-style-type: none"> - Identify plants for interior and exterior planting - Identify different plants for different sites (sunny, shade) - Prepare planting lists for different types of vertical greening system (Latin nomenclature and pot size) - Prepare planting lists for different indoor and outdoor situations (Latin nomenclature and pot size) 	<p>Students upgrade their knowledge on botany, plant physiology and growing requirements.</p> <p>Students gain critical thinking of the use of various plant species in vertical greening systems, knowledge of basic botany and growing requirements</p> <p>Students develop a sense of responsibility for effective use of plants.</p>
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Learning Unit 4 MAINTENANCE OF VERTICAL GREENING SYSTEMS

	<ul style="list-style-type: none"> - Understand the basic needs of plants and the causes of physiological stress - Understand common pests and diseases and other signs of stress (drought, moisture, cold, light, nutrients, etc.) - Understand appropriate treatments for pests and diseases - Understand the techniques of plant replacement - Understand pruning techniques - Understand the effect of seasonal variation on the maintenance of vertical greening systems (adjustment of light, irrigation etc.) - Understand how to check the integrity of a system (irrigation, lighting, controls etc.) and how to troubleshoot - Understand how to prepare a maintenance plan 	<ul style="list-style-type: none"> - Identify the basic needs of plants and the causes of physiological stress - Identify common pests and diseases and other signs of plant stress - Apply treatments for pests and diseases - Replace plants - Prune plants - Describe the effect of seasonal variation on the maintenance of vertical greening systems - Describe how to check the integrity of a system (irrigation, lighting, controls etc.) and how to troubleshoot 	<p>Students acquire knowledge of the use of plants, their requirements and care.</p> <p>Students gain critical thinking about the maintenance of vertical greening systems, and a duty of care for living plants.</p>
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3.3 EQF TRANSLATOR for 'Vertical Gardening' VET module – LEVEL 5

EQF descriptor Level 5	Knowledge Comprehensive, specialized, factual and theoretical knowledge within a field of work or study and an awareness of the boundaries of that knowledge	Skills A comprehensive range of cognitive and practical skills required to develop creative solutions to abstract problems	Competences Exercise management and supervision in contexts of work or study activities where there is unpredictable change; review and develop performance
Learning Unit 1 INTRODUCTION TO VERTICAL GREENING SYSTEMS			
	<ul style="list-style-type: none"> - Understand the benefits of vertical greening - Understand the historical development of vertical greening - Understand the difference between natural and artificial ecosystems - Understand the different types of vertical greening systems and their relative sustainability - Understand the different types of substrate and their appropriate use 	<ul style="list-style-type: none"> - Identify the benefits of vertical greening - Outline the historical development of vertical greening - Identify the differences between natural and artificial ecosystems - Identify the different types of vertical greening systems - Identify the difference between media-based and hydroponic vertical greening systems 	<p>Students gain critical thinking about the benefits of plants in urban environments.</p>
Learning Unit 2 INSTALLATION OF VERTICAL GREENING SYSTEMS			
	<ul style="list-style-type: none"> - Understand health and safety issues relating to the installation of vertical greening systems - Understand appropriate locations for vertical greening systems in interior and exterior environments - Understand general principles for the construction and installation of vertical greening systems including non-permeable membranes, irrigation and lighting systems, and sensors - Understand appropriate planting techniques relative to the different types of vertical greening systems - Understand appropriate techniques for water preparation including sterilization and fertigation 	<ul style="list-style-type: none"> - Identify the health and safety issues relating to the installation of vertical greening systems - Identify appropriate locations for smaller (20m²) vertical greening systems in indoor and outdoor environments - Draw an annotated diagram of a vertical greening system (cross-section and short text description) - Install a simple living wall system - Install irrigation pipes - Install a lighting system - Install sensors - Describe appropriate planting techniques relative to the different types of vertical greening systems - Describe appropriate techniques for water preparation including sterilization and fertigation 	<p>Students gain knowledge on of the techniques for installing vertical greening systems.</p> <p>Students understand the various practical skills needed for installing vertical greening systems and pertinent health and safety issues.</p> <p>Students learn how to work effectively as part of a team in order to construct a simple living wall.</p>

Learning Unit 3 PLANTS FOR VERTICAL GREENING SYSTEMS

	<ul style="list-style-type: none"> - Understand suitable plant selection for interior and exterior vertical greening systems, including selection of appropriate pot sizes, duration of time to establishment, plants for shade vs. plants for sun, deciduous vs. evergreen - Understand plant hardiness zones and the hardiness ratings of plants suitable for vertical greening systems 	<ul style="list-style-type: none"> - Identify plants for interior and exterior planting - Identify different plants for different sites (sunny, shade) - Prepare planting lists for different types of vertical greening system (Latin nomenclature and pot size) - Prepare planting lists for different indoor and outdoor situations (Latin nomenclature and pot size) 	<p>Students upgrade their knowledge of botany, plant physiology and growing requirements.</p> <p>Students gain critical thinking about the use of various plant species in vertical greening systems, and knowledge of basic botany.</p> <p>Students develop a sense of responsibility for effective use of plants.</p>
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Learning Unit 4 MAINTENANCE OF VERTICAL GREENING SYSTEMS

	<ul style="list-style-type: none"> - Understand the basic needs of plants and the causes of physiological stress - Understand common pests and diseases and other signs of stress (drought, moisture, cold, light, nutrients, etc.) - Understand appropriate treatments for pests and diseases - Understand the techniques of plant replacement - Understand pruning techniques - Understand the effect of seasonal variation on the maintenance of vertical greening systems (adjustment of light, irrigation etc.) - Understand how to check the integrity of the system (irrigation, lighting, controls etc.) and how to troubleshoot - Understand how to prepare a maintenance plan 	<ul style="list-style-type: none"> - Identify the basic needs of plants and the causes of physiological stress - Identify common pests and diseases and other signs of plant stress - Apply treatments for pests and diseases - Replace plants - Prune plants - Describe the effect of seasonal variation on the maintenance of vertical greening systems - Describe how to check the integrity of the system (irrigation, lighting, controls etc.) and how to troubleshoot 	<p>Students acquire knowledge of the use of plants, their requirements and, care.</p> <p>Students gain critical thinking about the maintenance of vertical greening systems, and a duty of care for living plants.</p> <p>Students learn how to work effectively as part of a team in order to solve problems.</p>
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