



**INTRUST**

TRAINING SOLUTIONS FOR  
WOOD CERTIFICATION



# **INTRUST**

## **Joint curriculum design**



Co-funded by the  
Erasmus+ Programme  
of the European Union



The present work, produced by the INTRuST Consortium, is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License  
© KIT 2022

This publication was produced with financial support from the European Union.

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.

This report was prepared by INTRuST project technical team, composed by Volker Koch, Tahereh Mallahnia - Karlsruher Institut für Technologie (KIT), Erwan Mouazan, David Steinmetz (Ecores), Petar Antov (University of Forestry, Bulgaria), Igor Gavrić (Innorenuew), Gregorio Cañavate, Carmen Fernández Fernández (CETEM).

Lead partner



Associated organisations



# Table of content

<b>1.</b>	<b>INTRODUCTION</b>	<b>5</b>
<b>2.</b>	<b>METHODOLOGICAL APPROACH</b>	<b>7</b>
<b>3.</b>	<b>TARGET GROUPS</b>	<b>8</b>
<b>4.</b>	<b>MODULE OVERVIEW</b>	<b>9</b>
<b>5.</b>	<b>MODULE DESCRIPTION</b>	<b>10</b>
<b>6.</b>	<b>BRIDGING LEARNING OUTCOMES WITH TEACHING METHODS</b>	<b>16</b>
<b>7.</b>	<b>LEARNING PATHWAYS FOR INTRUST CURRICULUM</b>	<b>25</b>
<b>8.</b>	<b>CONCLUSIONS AND NEXT STEPS</b>	<b>27</b>

## ABOUT INTRUST

Forests are essential for our health and wellbeing, and the health of the planet. They are rich in biodiversity and are hugely important in the fight against climate change.

As the global demand for wood and wood-based materials is projected to increase threefold between 2010 and 2050, using wood more efficiently to meet projected demands for development of value-added wood-based products is a key circular economy principle. The growing environmental concerns and recent legislative regulations, related to promoting the 'cascading use' of wood, i.e., prioritising value-added non-fuel applications of wood resources, have posed new challenges to both industry and academia, related to the optimization of the available wood and lignocellulosic raw materials, recycling and reusing wood and wood-based composites, and search for alternative resources.

INTRuST project targets professionals from the wood value chain (forest operators, managers and employees from wood-based and furniture-related companies) to increase their professional skills and competences in relation to the twin transition of the sector. On one hand, the project aims to support the sector in recognizing, choosing, and implementing the right sustainable certifications. On the other hand, INTRuST aims to support the sector in developing a relevant body of knowledge associated with the digital transition.

For more information go to [intrust-project.eu](https://intrust-project.eu)

# 1. Introduction



INTRuST addresses experts from furniture-related companies, forest operators, companies' employees and managers to increase their skills and competences on sustainable certification in the industry 4.0.

INTRuST partnership brings together experts in technology, wood certification, forestry and energy consumption, forest certification and environmental marketing from different VET institutions, research entities and industry representatives to reach the following objectives:

- Increase the knowledge, skills and attitudes on climate change and sustainable development in VET through the design of a new curricula on environment-related strategies and certifications that will adapt VET provisions according to the skills needs of the addressing sectors and will contribute to the validation of non-formal learning.
- Improve digital readiness of wood and furniture manufacturers through the development of specific training of industry 4.0 in the forest and wood value chain which could support a "twin – green and digital – transition".
- Develop and test a digital coaching tool that will allow industries to know what certifications schemes are the most suitable and then suggest the appropriate training content to study in each case, contributing to the promotion of flexible and permeable pathways.

- Deliver the training through e-learning platform (MOOC) in different EU languages, providing interactive learning materials and promoting the use of open and online learning, as well as multidisciplinary learning approaches
- Raise awareness about the importance of the different certification schemes that can support the enterprises to improve their performance and sales.

This document aims to introduce the joint curriculum developed in the framework of the project.

## 2. Methodological approach

The design of joint curriculum followed the *Learning Outcomes Approach* according to the principles of ECVET so as to support lifelong learning, the flexibility of learning pathways and the assessment, recognition and accumulation of the learning outcomes of each individual.

According to the Recommendation on the European Qualifications Framework - EQF5, learning outcomes are '*statements of what a learner knows, understands and is able to do on completion of a learning process, which are defined as knowledge, skills and competences*'..

The qualification frameworks usually detail the overall level of learning outcomes. For ECVET purposes, the EQF is used as a reference for levels. Learning outcomes may be acquired through a variety of learning pathways, modes of delivery, in different learning contexts or settings.

In the context of Intrust, content developers defined the different learning outcomes with the suggestions of the sector experts and VET authorities using the terms of Knowledge, Skills and Competences according to the Council Recommendation on the European Qualification Framework for lifelong learning.

**Knowledge** means the outcome of the assimilation of information through learning. Knowledge is the body of facts, principles, theories and practices that is related to a field of work or study. In the context of the EQF, knowledge is described as theoretical and/or factual.

**Skills** means the ability to apply knowledge and use know-how to complete tasks and solve problems. In the context of the EQF, skills are described as cognitive (involving the use of logical, intuitive and creative thinking) or practical (involving manual dexterity and the use of methods, materials, tools and instruments).

**Competences** mean the proven ability to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations and in professional and personal development.

Such learning competences were grouped in units and sub units. A unit consists of a coherent set of knowledge, skills and competences that can be assessed and validated.

For this, a Unit Description Template was prepared, that includes the basic information for the description of units using ECVET principles:

- The generic title of the unit.
- The learning outcomes contained in the units, in terms of knowledge, skills and competences.
- The procedures and criteria for assessment of such learning outcomes.
- The ECVET points associated.

### 3. Target groups



The main beneficiaries of this common curriculum are the target groups that INTRUST defined:

- Forestry managers
- Wood and wood-related companies
- Professionals from wood-working and wood-related sectors,
- VET providers and higher education institutions specialized in the wood sector
- Regional, national and European employees and employers associations,
- Students and unemployed people interested in practical e-learning instruments for wood and building certifications.



## 4. Module overview

The Training curriculum is organised according to the following modules:

- 1. Sustainability in the forest-wood value chain**
  - 1.1 Introduction to the sector
  - 1.2 Key environmental impacts
  - 1.3 Challenges to overcome
  
- 2. Introduction to Industry 4.0**
  - 2.1 History and development
  - 2.2 Benefits, opportunities, and challenges
  - 2.3 Key applications in forestry, woodworking and furniture
  
- 3. EU regulatory landscape on Digital and Green transition**
  - 3.1 Framework, directives, regulations with green transition
  - 3.2 Frameworks directives regulations with digital transition
  
- 4. Sustainable certifications for the forest-wood value chain**
  - 4.1 Forestry
  - 4.2 Woodworking
  - 4.3 Furniture
  
- 5. Key enabling technologies for the forest-wood value chain supporting green transition**
  - 5.1 Forestry
  - 5.2 Woodworking
  - 5.3 Furniture
  
- 6. Closing the loop in the wood sector**
  - 6.1 Circular economy as an enabling transition strategy
  - 6.2 Circular business models in the wood value chain
  - 6.3 Digital circular case studies

## 5. Module description

### MODULE 1: SUSTAINABILITY IN THE FOREST-WOOD VALUE CHAIN

TRAINING UNIT	LEARNING OBJECTIVE	LEARNING OUTCOME	PEDAGOGICAL APPROACH (MATERIAL)	DURATION (HOURS)	ASSESSMENT METHODOLOGY	ECVET
<b>1.1 INTRODUCTION TO THE SECTOR</b>	Get an understanding of the whole value chain processes	Knowledge: describe the generic status and challenges of the sector	Video lecture PPT Reports and publications Interactive exercises	2	quiz	0,06
<b>1.2 KEY ENVIRONMENTAL IMPACTS</b>	Get an overview of the current environmental challenges faced by the whole value chain	<p>Knowledge: describe the main environmental impacts associated with the different steps of the value chain</p> <p>Skills: be aware of the current strategies in place to address environmental impacts</p> <p>Competences: identify relevant strategies to reduce environmental impacts</p>	Video lecture PPT Reports and publications Interactive exercises	2	quiz	0,06

**1.3 CHALLENGES TO OVERCOME**

Understand which sustainability challenges need to be addressed

Skills: prioritise the main environmental impacts to overcome

Competences: select and analyse relevant sustainability strategies

Video lecture  
PPT  
Reports and publications  
Interactive exercises

2

quiz

0,06

## INTRODUCTION TO INDUSTRY 4.0

### MODULE 2:

TRAINING UNIT	LEARNING OBJECTIVE	LEARNING OUTCOME	PEDAGOGICAL APPROACH (MATERIAL)	DURATION (HOURS)	ASSESSMENT METHODOLOGY	ECVET
<b>2.1 HISTORY AND DEVELOPMENT</b>	Describe the concept of Industry 4.0 and its current status	Knowledge: know the history and current development of i4.0	Video lecture PPT Reports and publications Interactive exercises	3	quiz	0,1
<b>2.2 BENEFITS, OPPORTUNITIES, AND CHALLENGES</b>	Understand the benefits and challenges associated with the concept	Skills: recognize the benefits and challenges of i40 technologies	Video lecture PPT Reports and publications Interactive exercises	3	quiz	0,1
<b>2.3 KEY APPLICATIONS IN FORESTRY, WOOD WORKING AND FURNITURE</b>	Understand how i4.0 can be implemented in the wood furniture value chain	Knowledge: be aware of the latest key applications in the whole value chain	Video lecture PPT Reports and publications Interactive exercises	3	quiz	0,1

### MODULE 3: EU REGULATORY LANDSCAPE ON DIGITAL AND GREEN TRANSITION

TRAINING UNIT	LEARNING OBJECTIVE	LEARNING OUTCOME	PEDAGOGICAL APPROACH (MATERIAL)	DURATION (HOURS)	ASSESSMENT METHODOLOGY	ECVET
<b>3.1 FRAMEWORK, DIRECTIVES, REGULATIONS WITH GREEN TRANSITION</b>	Describe the policy landscape at EU level supporting the green transition of the manufacturing sector	<p>Knowledge: know the relevant and latest regulations influencing the whole sector</p> <p>Skills: identify how the regulations affect the sector</p> <p>Competences: Develop strategies tot be aligned with current and future regulations</p>	<p>Video lecture PPT Reports and publications Interactive exercises</p>	3	quiz	0,1
<b>3.2 FRAMEWORKS DIRECTIVES REGULATIONS WITH DIGITAL TRANSITION</b>	Describe the policy landscape at EU level supporting the digital transition of the manufacturing sector	<p>Knowledge : know the relevant and latest regulations influencing the whole sector</p> <p>Skills: identify how the regulations affect the sector</p> <p>Competences: develop strategies to be aligned with current and future regulations</p>	<p>Video lecture PPT Reports and publications Interactive exercises</p>	3	quiz	0,1

## MODULE 4: SUSTAINABLE CERTIFICATIONS FOR THE FOREST-WOOD VALUE CHAIN

TRAINING UNIT	LEARNING OBJECTIVE	LEARNING OUTCOME	PEDAGOGICAL APPROACH (MATERIAL)	DURATION (HOURS)	ASSESSMENT METHODOLOGY	ECVET
<b>4.1 SUSTAINABLE CERTIFICATIONS IN FORESTRY</b>	Get an overview of the key certifications and their processes in the forestry sector	<p>Knowledge: list existing certifications that can be applied in the sector (FSC, PEFC)</p> <p>Skills: identify relevant certifications</p> <p>Competences: analyse, compare and select the right certification.</p>	<p>Video lecture</p> <p>PPT</p> <p>Reports and publications</p> <p>Interactive exercises</p>	5	quiz	0,16
<b>4.2 SUSTAINABLE CERTIFICATIONS IN WOODWORKING</b>	Get an overview of the key certifications and their processes in the woodworking sector	<p>Knowledge: list existing certifications that can be applied in the sector</p> <p>Skills: identify relevant certifications</p> <p>Competences: analyse, compare and select the right certification.</p>	<p>Video lecture</p> <p>PPT</p> <p>Reports and publications</p> <p>Interactive exercises</p>	5	quiz	0,16
<b>4.3 SUSTAINABLE CERTIFICATIONS IN FURNITURE</b>	Get an overview of the key certifications and their processes in the furniture sector	<p>Knowledge: list existing certifications that can be applied in the sector (ecolabel,EMAS,, iso14001, etc.)</p> <p>Skills: identify relevant certifications</p> <p>Competences: analyse, compare and select the right certification.</p>	<p>Video lecture</p> <p>PPT</p> <p>Reports and publications</p> <p>Interactive exercises</p>	5	quiz	0,16

## MODULE 5: KEY ENABLING TECHNOLOGIES FOR THE FOREST-WOOD VALUE CHAIN SUPPORTING GREEN TRANSITION

TRAINING UNIT	LEARNING OBJECTIVE	LEARNING OUTCOME	PEDAGOGICAL APPROACH (MATERIAL)	DURATION (HOURS)	ASSESSMENT METHODOLOGY	ECVET
5.1 KET IN FORESTRY	Describe Key Enabling Technologies (KETs) supporting the forestry industry	<p>Knowledge: understand how KET can support a digital transition in the sector</p> <p>Skills : Identify relevant KETs</p> <p>Competences : select and prioritise relevant KETs</p>	<p>Video lecture</p> <p>PPT</p> <p>Reports and publications</p> <p>Interactive exercises</p>	5	quiz	0,16
5.2 KET IN WOODWORKING	Describe Key enabling technologies (KETs) supporting the woodworking industry	<p>Knowledge: understand how KET can support a digital transition in the sector</p> <p>Skills: identify relevant KET</p> <p>Competences: select and prioritise relevant KETs</p>	<p>Video lecture</p> <p>PPT</p> <p>Reports and publications</p> <p>Interactive exercises</p>	5	quiz	0,16
5.3 KET IN FURNITURE	Describe Key Enabling Technologies (KETs) supporting the furniture industry	<p>Knowledge: understand how KET can support a digital transition in the sector</p> <p>Skills: Identify relevant KETs</p> <p>Competences: select and prioritise relevant KETs</p>	<p>Video lecture</p> <p>PPT</p> <p>Reports and publications</p> <p>Interactive exercises</p>	5	quiz	0,16

## MODULE 6: CLOSING THE LOOP IN THE WOOD SECTOR

TRAINING UNIT	LEARNING OBJECTIVE	LEARNING OUTCOME	PEDAGOGICAL APPROACH (MATERIAL)	DURATION (HOURS)	ASSESSMENT METHODOLOGY	ECVET
---------------	--------------------	------------------	---------------------------------	------------------	------------------------	-------

<p><b>6.1 CIRCULAR ECONOMY AS AN ENABLING TRANSITION STRATEGY</b></p>	<p>Understand how circular economy can be used as an overarching approach to make the wood value chain more resilient and sustainable.</p>	<p>Knowledge: understand the basic principles of circular economy</p> <p>Skills: recognize the most useful circular strategy for its own company</p> <p>Competences : use tools to select and prioritize circular and digital strategies</p>	<p>Video lecture PPT Reports and publications Interactive exercises</p>	<p>3</p>	<p>quiz</p>	<p>0,1</p>
<p><b>6.2 CIRCULAR BUSINESS MODELS IN THE WOOD VALUE CHAIN</b></p>	<p>Understand how business model innovation can provide benefits for sustainability and profitability</p>	<p>Knowledge : understand the concept of circular business models applied to the wood sector</p> <p>Skills: recognize how to implement circular strategies in its own operations</p> <p>Competences: have the capacity to apply circular tools to develop a circular business model</p>	<p>Video lecture PPT Reports and publications Interactive exercises</p>	<p>3</p>	<p>quiz</p>	<p>0,1</p>
<p><b>6.3 DIGITAL CIRCULAR CASE STUDIES</b></p>	<p>Map and recognize inspiring practices of circular and digital transition in the wood sector</p>	<p>Knowledge: acquire multiple references to be inspired in implementing circular business models</p> <p>Skills: being able to describe how some business models apply circular thinking</p>	<p>PPT Reports and publications Interactive exercises</p>	<p>3</p>	<p>quiz</p>	<p>0,1</p>

## 6. Bridging learning outcomes with teaching methods

The purpose of this section is to give teachers/trainers the necessary minimum of theoretical knowledge how to organize, prepare and conduct the training process and to make them familiar with recent approaches and methods for vocational education and training. It is aimed at understanding the essence of modern rather than traditional training methods as well as motivating teachers/trainers to use approaches, methods and techniques for this type of teaching.

### Contemporary teaching methods

In the past, vocational education and training provided general education and prepared learners for a clearly defined trade or profession. The pace of technological development and changes in how work is organized have led to shifting the focus on innovation and lifelong learning. Having the world of global information at our fingertips, the significance of acquiring and storing huge quantities of quickly outdated, pre-selected knowledge has decreased tremendously. All these changes are transforming the way we perceive knowledge, skills and learning.

Nowadays, the emphasis is on developing action competences, i.e. on developing capacities for dealing with certain work or life situations in which the ability to apply knowledge and solve practical problems is central. Vocational education and training also aim to prepare individuals to actively shape their personal and professional lives and take part in society in a self-guided manner. People need to learn how to reflect on their experiences and on the world around them with a view to seizing new opportunities, living up to challenges and ultimately becoming responsible citizens in a sustainable development context.

The contemporary vocational education and training should be focused on fostering motivation, creativity, leadership, self-evaluation, self-guidance, reflection, critical and cross-disciplinary thinking, flexibility, digital literacy, time management, (international) team working, problem-solving and social skills. Self-directed and innovative approaches to work and learning have become key lifelong learning competences. Competences of this kind are not linked to any specific subject matter, but are, rather, cross-curricular key competences. They are essential to building action competence that go beyond the traditional perception of technically trained people exercising a certain trade or profession. All these changes are transforming the way people acquire knowledge and skills. Vocational education and training nowadays need to prepare learners for a more complex society that calls for comprehensive and broad-based professional competences and the ability to adapt to changing circumstances and deal with unknown and unanticipated situations.

In the contemporary vocational training, formulating the 'right' learning goals (learning outcomes) and choosing the 'right' learning content is of greatest importance to fulfill



the pre-defined aims of the training process. It would logically seem to be more meaningful to describe, with the help of employers, major areas of work and situations likely to be encountered by learners in their future working and social lives. This is the basis on which holistic interdisciplinary competence should be built.

The aforementioned learning outcomes are a key concept in the design of European instruments fostering transparency, comparability, transferability and recognition of qualifications between different countries and at different levels. In this definition, the form of learning is not specified: it can take place either in formal or non-formal education arrangements, or informally through experience gained in the community or at the workplace.

Learning outcomes statements help to clarify programs and qualifications intentions and make it easier for the learners, teachers/trainers or assessors to work towards these expectations.

Some authors point to the risk of confusion when no difference is made between intended and achieved learning outcomes. The authors differentiate between learning objectives, learning outcomes and learning success. Learning objectives are the knowledge, skills and competences intended by the teacher, which the student should achieve through the learning process. Learning outcomes are all competences, knowledge and skills acquired by the learner through the learning process. Learning success is the assessed overlap between these two elements, i.e. the totality of knowledge, skills and competence which was intended and achieved, excluding non-intended or non-achieved learning outcomes (see the figure below).

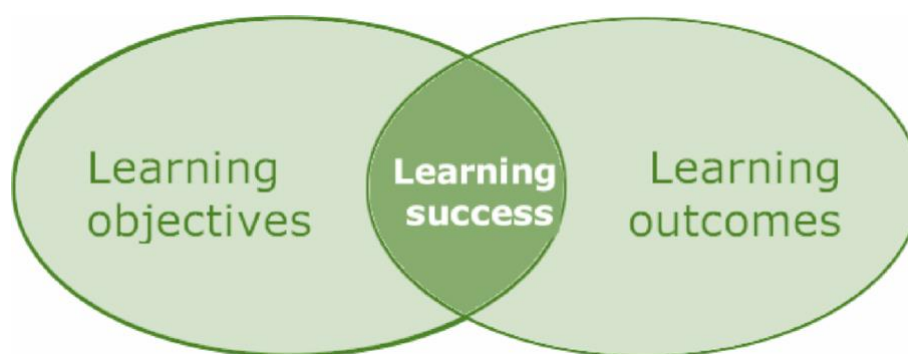


Figure 1: learning success - Source: Euler and Hahn, 2004, p. 121

There is no single way of defining and writing learning outcomes; the approach has to reflect the particular purpose and context in question. As documented by Cedefop (2016) the following purposes are common across Europe:

### **Qualifications frameworks**

Qualifications frameworks play an increasingly important role at international, national and sectoral level. Learning-outcomes-based frameworks seek to increase transparency and allow for comparison of qualifications across institutional and national borders. The learning outcomes descriptors of qualifications frameworks are normally

designed using a horizontal axis identifying learning domains (such as knowledge, skills and competence) and a vertical dimension indicating how the complexity of learning increases from level to another.

### **Qualification profiles and/or standards**

Qualification standards define the expected outcomes of the learning process, leading to the award of a full or partial qualification. In vocational education and training, profiles or standards normally answer questions such as ‘what does the student need to learn to be effective in employment’ and ‘what does the learner need to learn to become an active citizen, supporting basic human and democratic values?’ A qualification standard is not exclusively about promoting skills relevant to the labor market but must address a broader set of competences relevant to life and society in general. It must also consider the changing nature of the labor market and society and clarify the role of transversal skills and competences, for example related to communication, social skill and problem-solving. The European credit system for VET (ECVET) has paid particular attention to the identification of units of learning outcomes; it sees these as critical for promoting transfer and accumulation of vocational skills and competences across Europe.

### **Occupational standards**

Occupational profiles or standards are normally set outside the education and training system, by labor market stakeholders, but can have significant impact on the way learning outcomes statements are defined and written. Occupational profiles or standards specify ‘the main jobs that people do’, describing the professional tasks and activities as well as the competences typical for an occupation. Occupational standards show what students must be able to do in employment and can serve as the link between education and training and the needs of the labor market. An occupational standard will normally differ significantly from a qualification standard. A qualification standard needs to look beyond the specific functions of a single job or occupation and prepare learners for various jobs and occupations which inevitably will change over time.

### **Curricula**

Curricula set the framework for planning learning experiences. Depending on the country, the type of education and training, and the institution, learning outcomes statements form an important part of curricula. They guide teachers in the teaching process, for example supporting the choice of methods, and they inform learners about what they are expected to know/do and understand after a given learning activity. Learning outcomes in curricula can differ in detail; sometimes defining outcomes of an entire program, sometimes focusing on specific outcomes of a training module.

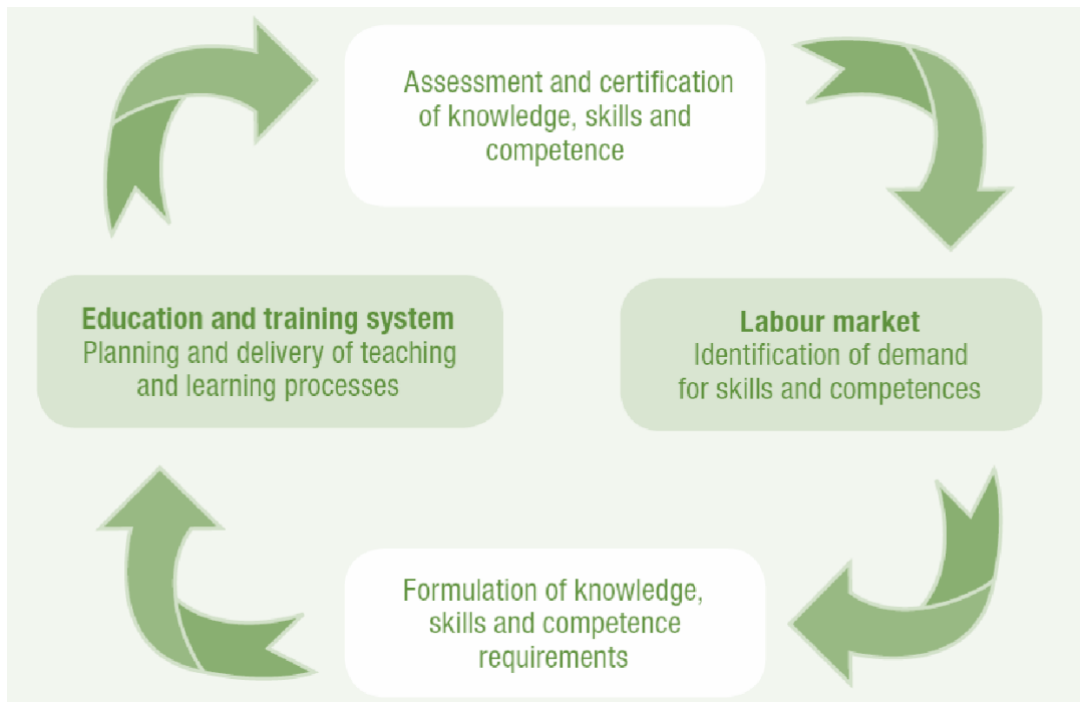
### **Assessment specification and/or standards**

Assessment specifications identify the methods and the criteria for assessments. These criteria, using learning outcomes statements, are often formulated as threshold levels which have to be met by the learners. Assessment standards and the criteria they use are more detailed than qualifications standards and curricula in the sense that they have to describe the requirements precisely to the learner. These requirements normally

support summative assessments at the end of the learning process but can also orient formative assessments taking place throughout the learning process.

Learning outcomes are perceived as adding value to the following different purposes:

- for the learners: learning outcomes statements clarify what a learner is expected to know and be able to do and understand having completed a learning sequence, a module, a program or a qualification. They support initial choice of education, training and/or learning paths; they help to orient the learning process itself; and they clarify what to expect during assessment. In order to make any difference to learners, learning outcomes must be visible not only in qualification standards and program descriptions. Their visibility in practice, throughout the teaching and learning process as well in assessment arrangements, is of critical importance;
- for the teachers/instructors: the learning outcomes approach helps to orient teaching, to select the most appropriate methods and to support the learning process. Learning outcomes, through their focus on the requirements to learning process are crucial for promoting a more systematic reflection on assessment criteria and methods and how these interact with and support the learning process;
- for the assessors: the learning outcomes approach supports assessment by clarifying the criteria for success/failure and performance. While most frequently linked to summative assessments, learning outcomes can help with formative assessment throughout the learning process;
- for the education and training institutions: learning outcomes provide an important instrument for planning, and for internal and external dialogue. The perspective helps to determine the purpose and orientation of a course, a program or qualification and to clarify how it relates to and/or overlaps with other programs and qualifications. Learning outcomes can provide an important reference point for quality assurance; the relationship between intended and actual learning outcomes provides important input to the continuous review and development which is expected from education and training institutions;
- for society and labor market: learning outcomes provide a common language allowing different stakeholders in education and training, as well as the labor market and society at large, to clarify skills needs and to respond to these in a relevant way. If used systematically, this allows for systematic review of the quality and relevance of education and training, focusing on the relationship between intended and actually achieved learning outcomes. The continuous quality assurance of vocational education and training depends on the constant feedback between VET and the labor market - the intentions expressed by the vocational education and training system are constantly challenged by experiences from the labor market and society (see the figure below).



Source: Cedefop, 2017

Understanding the effects of vocational pedagogies, and particularly of learner-centered approaches, can help VET teachers and trainers more effectively match teaching and learning methods to the needs of their students and their contexts. The learner-centered approach encompasses methods of teaching that shift the focus of instruction from the teacher to the learner, aiming at development of learner autonomy and independence by putting responsibility for the learning path in the hands of learners. Learner-centered instruction focuses on skills and practices that enable lifelong learning and independent problem-solving. In a learner-centered environment, learners choose what they will learn, how they will learn, and how they will assess their own learning. This is in contrast to traditional education, also dubbed "teacher-centered learning", which situates the teacher as the primarily "active" role while learners take a more "passive", receptive role.

In this way the application of contemporary teaching methods can directly impact on the quality of teaching and learning and achieve the wider goals of vocational education and training.

Some of the most widely used contemporary teaching methods, incorporating learner-centered approach to the training process, are presented below.

### **Interdisciplinary teaching**

Interdisciplinary instruction entails the use and integration of methods and analytical frameworks from more than one academic discipline to examine a theme, issue, question or topic. Interdisciplinary education makes use of disciplinary approaches to examine topics but pushes beyond by: taking insights from a variety of relevant

disciplines, synthesizing their contribution to understanding, and then integrating these ideas into a more complete, and hopefully coherent, framework of analysis.

Engaging students and helping them to develop knowledge, insights, problem solving skills, self-confidence, self-efficacy, and a passion for learning are common goals that educators bring to the classroom and interdisciplinary instruction and exploration promotes realization of these objectives. Interdisciplinary teaching fosters advances in cognitive ability. The main distinct educational benefits of interdisciplinary learning include the ability to recognize bias; think critically; tolerate ambiguity; acknowledge and appreciate ethical concerns.

Interdisciplinary instruction fosters the acquisition of foundational knowledge, promotes integration of ideas from multiple disciplines and provides insight on how to apply knowledge all of which advance learners' understanding of how to learn. Moreover, it helps learners develop their cognitive abilities - brain-based skills and mental processes that are needed to carry out tasks. Interdisciplinary learning fosters a number of cognitive attributes, such as the acquisition of perspective-taking techniques (the capacity to understand multiple viewpoints on a given topic), development of structural knowledge (both declarative knowledge (factual information) and procedural knowledge (process-based information)).

### **Interdisciplinary Team Teaching**

Team teaching involves a group of instructors working purposefully, regularly, and cooperatively to help a group of students of any age learn. Teachers together set goals for a course, design a syllabus, prepare individual lesson plans, teach students, and evaluate the results. They share insights, argue with one another, and perhaps even challenge students to decide which approach is better.

There are three main types of team teaching: (1) two or more teachers loosely sharing responsibilities; (2) team planning, but individual instruction; and (3) joint planning, instruction, and evaluation of learning experiences. New teachers may be paired with veteran teachers. Innovations are encouraged, and modifications in class size, location, and time are permitted. Different personalities, voices, values, and approaches spark interest, keep attention, and prevent boredom. The team-teaching approach allows for more interaction between teachers and students. Teachers evaluate students on their achievement of the learning goals; students evaluate teachers on their teaching proficiency. Emphasis is on student and teacher/trainer development, balancing initiative and shared responsibility, specialization and broadening horizons, the clear and interesting presentation of content and student development, democratic participation and common expectations, and cognitive, affective, and behavioral outcomes. This combination of analysis, synthesis, critical thinking, and practical applications can be done at all levels of education.

Working as a team, teachers model respect for differences, interdependence, and conflict-resolution skills. Team members together set the course goals and content, select common training materials, and develop tests and final examinations for all

students. They set the sequence of topics and supplemental materials. They also give their own interpretations of the materials and use their own teaching styles. The greater the agreement on common objectives and interests, the more likely that teaching will be interdependent and coordinated.

Teaching periods can be scheduled side by side or consecutively. For example, teachers of two similar classes may team up during the same or adjacent periods so that each teacher may focus on that phase of the course that he or she can best handle. Students can sometimes meet all together, sometimes in small groups supervised by individual teachers or teaching assistants, or they can work singly or together on projects in the library, laboratory, or fieldwork. Teachers can be at different sites, linked by video-conferencing, satellites, or the Internet.

Team teaching can have a highly positive impact on student learning outcomes, largely due to the increased opportunity for student participation that team teaching provides. The presence of more than one instructor in the classroom increases the occasions for student-teacher interaction. More importantly, a collaborative teaching environment invites students to take a more active role in the learning process. Because team teaching encourages a variety of perspectives on a topic, students are more likely to feel they can make valuable contributions to class discussions.

Team teaching boasts many pedagogical and intellectual advantages: it can help create a dynamic and interactive learning environment, provide instructors with a useful way of modeling thinking within or across disciplines, and also inspire new research ideas and intellectual partnerships among teachers/trainers. To experience the full benefits of team teaching, however, instructors must adjust their course planning and classroom management strategies to accommodate a collaborative approach.

### **Self-regulated learning**

Self-regulated learning refers to student's ability to understand and control one's learning environment. Self-regulation abilities include goal setting, self-monitoring, self-instruction, and self-reinforcement. It should not be confused with a mental ability or an academic performance skill. Instead, self-regulation is a self-directive process and set of behaviors whereby learners transform their mental abilities into skills and habits through a developmental process that emerges from guided practice and feedback. Self-regulated learning is a cyclical process, wherein the student plans for a task, monitors their performance, and then reflects on the outcome. The cycle then repeats as the student uses the reflection to adjust and prepare for the next task. The process should be tailored for individual students and for specific learning tasks.

The figure below illustrates the key phases of the process. These different steps are performed by the student, but instructors play a vital role in guiding and coaching students through each step.

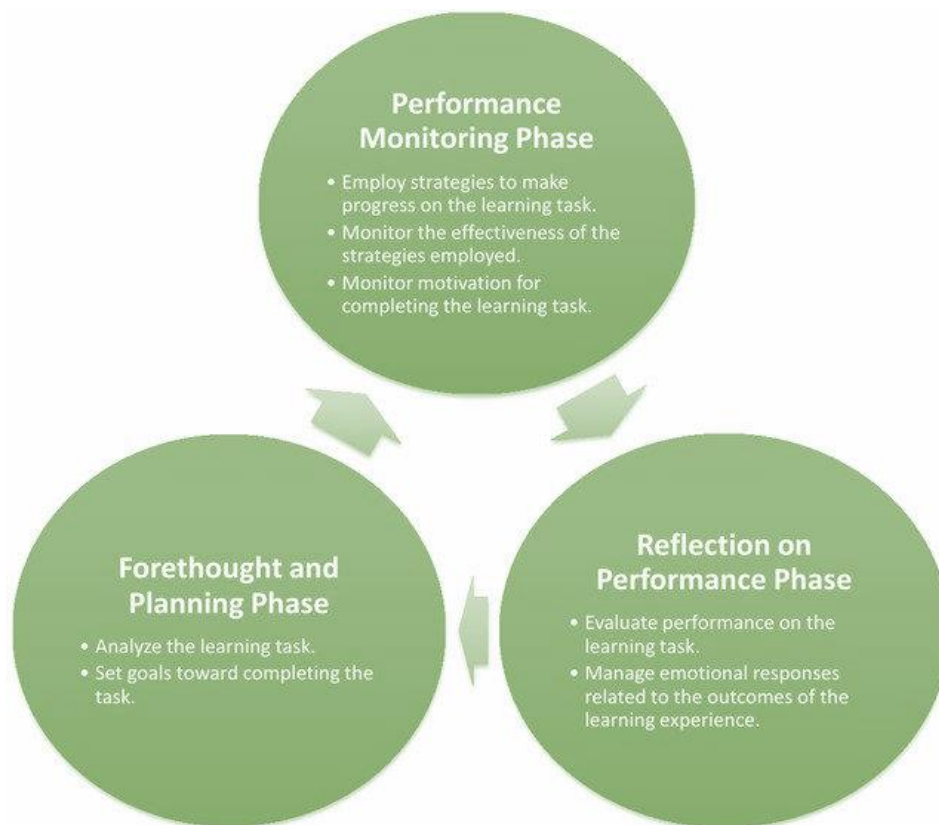


figure 2: self-regulated training .Source: Sharon Zumbrunn, 2011

The successful self-regulators develop the necessary skills and habits to be effective learners, exhibiting effective learning strategies, effort, and persistence. The key for instructors is to understand how to foster and train these skills in all students. Self-regulated learning strategies help to prepare learners for lifelong learning and the important capacity to transfer skills, knowledge, and abilities from one domain or setting to another.

The self-regulated learning consists of three components: cognition, metacognition, and motivation. The cognition component includes the skills and habits that are necessary to encode, memorize, and recall information as well as think critically. Within the metacognition component are skills that enable learners to understand and monitor their cognitive processes. The motivation component surfaces the beliefs and attitudes that affect the use and development of both the cognitive and metacognitive skills.

### **Action-oriented and project-based learning**

Action-oriented learning is a pedagogic approach that defines the role of teachers in supporting self-directed acting and experiential learning in authentic situations on the part of the learners. As a result of the action-oriented learning, learners are expected to acquire not only skills and knowledge laid down in qualifications, unit standards and skeleton curricula, but also technical, individual, methodological and social competences and attitudes.

Action-oriented learning is a concept of education emphasized on learning by doing. The learning process contains expedient objectives in the form of tasks and problems on the basis of which learners can organize their activities independently. The learners are given incentives and scope within theoretic knowledge and practical experience to develop their motivation on the basis of expected success.

Action knowledge would be better acquired by means of active problem solving in project-based learning, where in addition to technical, some methodological, social and personal competences will be acquired. Action-oriented learning needs suitable tasks for the learner to offer chances for self-responsible and self-organized learning with processes of communication and cooperation between the learners and the teacher/trainer. With the project-based learning, learners are set with the task to create a product or a service. The process is supposed to activate as much skills, knowledge and abilities as possible in order to create new competences this way. Theoretical and practical contents are equally learned and correlated. The training institution and the teacher should provide a learning environment with all necessary facilities including the tools, workshop, required theoretical training materials and the curriculum. Within the project, the learners have to gather the necessary information and acquire the knowledge needed to fulfill the task. Usually learners work and learn together as a team in the project, so that they could reflect on issues faced, and to balance the conflict between job and academic knowledge. Learning driven by making is much more attractive in comparison with passively receiving knowledge in a lecture, it promotes the motivation and enhances interests and abilities for self-regulated learning.

Preparing learners for complex situations and the world of work poses new challenges for vocational education and training. People need broad work and social competences i.e. holistic action competence incorporating cross-disciplinary key competences. This alters the mandate for vocational education, as it is not sufficient to be trained once in a lifetime for a narrow specialization in line with functional prescriptions. Building on solid traditional foundations, the modern vocational training should give people the necessary theoretical knowledge and practical skills to reflect on the world, think critically, seize opportunities and solve problems, especially in new, complex and unexpected work situations.



## 7. Learning pathways for INTRUST curriculum

### 7.1 Dual learning pathway approach

Intrust curriculum will follow a dual learning pathway approach which will be distinguished by the target groups identified in section 3 of this report.

On the one hand, students enrolled in formal educational programme will be expected to follow a comprehensive exhaustive learning pathways going through all the modules developed within the curriculum. A full completion of the entirety of the training will lead to a certificate of completion provided the student fulfills the evaluation process (individual quizzes for each module with a minimum success rate of 70-80%).

On the other hand it is expected that professionals (forestry, woodworking and furniture industry professionals..) will follow a tailored approach related to their training needs, focusing on specific modules, units, and sub units. This learning pathway will be facilitated by the Coaching tool developed as a part of the project, which will support trainees in identifying the relevant certifications and industry 4.0 tools that can be relevant to their own contexts. The assessment tool will allow trainees to prioritize certain modules and units to be completed in order to focus on the right knowledge.

### 7.2 Microlearning format

In the context of the Intrust Training Curriculum development, a microlearning approach will be favoured. Microlearning is considered a specific pedagogical method focused on the use of specific, small and subjective learning units and/or learning activities.

Microlearning delivers short and focused content bites at various intervals, such as days, weeks or months. Such spaced repetition effectively overcomes memory loss caused by the “forgetting curve.” Managers usually prefer microlearning because it provides on-demand and up-to-date information and training.

Effective microlearning always fits well into people’s daily workflow and motivates them to engage with it voluntarily. Ultimately, it shapes how people think and behave (Dolasinski & Reynolds, 2020). An effective micro learning unit usually lasts no more than three to five minutes (Fox, 2016; Dolasinski & Reynolds, 2020) and fits naturally into the daily workflow. It also motivates employees to engage with it voluntarily and progressively adapt the content to support employees’ behavioral change that impacts specific business results. Each microlearning module usually is used in combination with a series of other microlearning modules over a period of time to support a larger training goal (Kapp & Defelice, 2019).

### Key elements of a microlearning module

A microlearning module usually consists of four key elements: Micro learning objectives (MLO), Micro learning content (MLC), Micro learning delivery (MLD) and Micro learning evaluation (MLE).

**1. Microlearning objectives (MLO):** Microlearning objectives (MLO) needs to be simple, direct and specific. With specific titles and micro learning objectives, you can help distracted learners focus in time-compressed workplaces. You can also accurately index microlearning topics for future on-demand training.

**2. Microlearning content (MLC):** Microlearning content (MLC) contains the core training information and activities. Try to focus on one key idea plus three supporting subtopics for each micro unit.

**3. Microlearning delivery (MLD):** Different content commands different formats of media (Karvounidis, et al., 2014). Besides articles and PowerPoints, videos are the most popular delivery method currently. Infographics is also a common delivery format for microlearning modules. Infographics, in particular, can enhance appeal, comprehension, and learning retention. It can visualize processes and guide learn-to-learner discussions or feedback practices (Ott, et al., 2014; Vanichvasin, 2013; Nuhoğlu, 2017)

**4. Microlearning evaluation (MLE):** The final piece is evaluation. The ultimate goal for a microlearning unit is behavioral change. Activity, context and feedback are key for this purpose.

This generic approach will be applied in the different training modules developed in the context of the project.

## 8. Conclusions and next steps

The joint curriculum described in section 5 provides an overview of the knowledge, skills, competences necessary for the wood-furniture value chain operators to navigate through a green and digital transition.

Module 1 provides an overview of the Sustainability challenges of the forest-wood value chain (introduction to the sector, key environmental impacts, challenges to overcome); Module 2 provides an overview of Industry 4.0 (history and development, benefits, opportunities, and challenges, key applications in forestry, woodworking and furniture); Module 3 highlights the EU regulatory landscape on Digital and Green transition; Module 4 deep dives into sustainable certifications for the forest-wood value chain; Module 5 describes the key enabling technologies supporting a green transition; Module 6 - closing the loop in the wood sector - takes a circularity thinking approach and introduces digital circular business models in the wood value chain.

As a next step, the described curriculum will be discussed and validated by a set of external stakeholders with expertise in the sector and topics addressed. Upon validation, the development of each modules, units and sub units will be launched .