

Training pathway for the development of teachers' non-technological competences

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Abbreviations

EU	European Union
HVET	Higher Vocational Education and Training
I4.0	Industry 4.0
ICT	Information and Communication Technology
IoT	Internet of Things
IT	Information and Communication Technology
KSA	Knowledge, skills, attitudes
MOOC	Massive Online Open Course
OER	Open Educational Resources
PDCA	Plan-Do-Check-Act (steps of the Deming's circle)
TU	Training Unit(s)
VET	Vocational Education and Training
WP	Work placement
XPM	Extreme project management

Foreword

“Fit for 4.0: training trainers and teachers for the 4.0 paradigm” is a project co-funded by the European Commission in the framework of the Erasmus+ Programme. Its goal is supporting teachers and trainers in the transition towards the new learning paradigm required by the digital transformation and the fourth industrial revolution.

Industry 4.0, digital revolution, smart factories, global interconnection – these are the keywords describing the present developments of the labour world. Vocational training can become “the first choice” to live this transformation, but at present only a few training centres in Europe can exploit necessary equipment and, even more important, teachers and trainers are not aware of the dimension of such changes, or can exploit the required tools (conceptual and methodological first, rather than technological). Some of them tend to focus on teaching rather than on learning; some are not fully aware of existing on-line tools for learning, teaching, assessing; some do not interact with each other as much as they could, thinking they have know-how to “defend”; some need a clearer picture of the nature, implications and real meaning of the 4.0 paradigm, which is not only “Industry” 4.0 and technology, but also involves the whole society.

In order to make VET sustainable, it is relevant updating its times and tools, favouring collaboration among teachers/trainers, learners, training providers, companies, social parts, local authorities.

Fit for 4.0 intends to take this challenge, by describing a set of competences useful to Vocational Education and Training (VET) teachers, and by developing and testing a set of training modules fit for “4.0”, in strict co-operation with companies.

Fit for 4.0 is performed by a strong consortium of 10 partners in 8 EU Member States: Italy, Austria, Belgium, Denmark, Finland, Portugal, Sweden, the United Kingdom, representing a competent and skilled mix of excellent European VET players, in the spirit of providing for a true “strategic partnership”.

This document describes the third project output, presenting a set of 7 training units, based on the distinctive competences identified for “4.0-ready” teachers and trainers (see “Set of competences targeted by the train-the-trainer programme”, available on project website at www.fitfor4-0.eu). As the title of this document says, the competences forming the learning output of this pathway are not technological, rather covering the didactic, strategic and personal domains, with a view to providing teachers and trainers with better awareness, useful tools and stronger ability to design, deliver and assess the learning chances they offer to students.

This document is also freely accessible on line at the project web site.

1. The project Fit for 4.0

Rationale

The project follows a three-step development pathway.

Step 1, based on existing studies and direct experiences collected from teachers in the partner Countries about changes brought by Industry 4.0, aims at:

- describing and highlighting competences necessary to trainers, with special reference to the mechanic/mechatronic/automotive sectors, having in mind ICT skills as the engine for the “4.0 world”. The focus is mostly on cross/soft skills, in addition to the professional ones that teachers already possess or can more easily develop.
- Delivering an on-line tool, allowing trainers to self-assess their readiness to handle and embed 4.0 topics in their daily work.

Step 2 designs and tests a train-the-trainers programme, structured in Training Units based on learning outcomes, with a pervasive and “intelligent” usage of IT tools. The programme will be developed in co-operation with local industry associated partners, especially as to learning objectives, and will include for example:

- the 4.0 paradigm: the scenario underlying the value creation chain for goods and services, in a globally interconnected environment;
- key enabling technologies for 4.0: chances, implications, didactics;
- how to design “4.0 learning experiences”: planning, instructional design;
- 4.0 as a multi-disciplinary topic: how to embed 4.0 in all subjects, how to make trainers co-operate;
- co-design with companies: how to improve co-operation among teachers, trainers, enterprises;
- joint learning assessment by trainers and companies, including assessment of informal and non-formal learning;
- how to keep oneself up-to-date with the evolution of 4.0.

All topics will convey into a Massive Online Open Course (MOOC), including exercises, video clips, quizzes and research material.

Step 3 aims at ensuring mainstreaming and impact of results in partner territories. Trainers in the sample group will exploit outcomes in their day-by-day activities, by reviewing/setting part of/full programmes based on lessons learnt. Trainers and trainees in partner territories will participate in a friendly contest, competing to deliver best practices. Effectiveness will be assessed together with associated partners and results collected in guidelines, including also histories describing cases emerging from the contest.

Objectives

Project objectives are:

- describing a “minimum” of skills, namely didactical and transversal, needed by teachers/trainers, especially those involved in Higher Vocational Education and training (HVET), with regard to the 4.0 transition;
- developing a competence self-assessment tool, allowing VET teachers/trainers to measure their readiness for the 4.0 world and digital transformation;
- developing and testing, in strong cooperation with enterprises, a resource pack for trainers, a training programme delivered as a MOOC (Massive Online Open Course), complete with examples of training material, methods for learning assessment, innovative tools for training and learning;
- exploiting that MOOC to train a sample group of trainers, who will pilot their learning by co-designing training modules/programs in this new 4.0 concept, together with businesses;
- making such products available to everyone, even beyond the partnership, through a knowledge base of Open Educational Resources (OER) freely accessible via the same on-line platform used by the sample group;
- identifying a set of policy recommendations/suggestions to local, national and European decision-makers, for future updating of teachers’ and trainers’ competences.

To ensure concreteness, the project focusses on the mechanic, mechatronic and automotive sectors, where advanced digital competences are necessary, the digital revolution is already started, and meaningful company experience is in place.

The train-the-trainer programme aims mostly at improving skills for teaching, using innovative methods and tools, embedding the 4.0 paradigm in day-by-day work. That is why it relates to topics like understanding the sense and the impact of the 4.0 paradigm on study and work, or how to develop and run interdisciplinary 4.0 learning experiences together with colleagues and companies, how to make use of training methods mirroring operational processes at the workplace, how to assess competences in the digital era, and so on.

This train-the-trainer programme is practical and at the same time “intrinsically digital”, built up with the same instruments it offers, that is, by transnational teams composed by trainers and company experts, making use of on-line cooperative platforms.

Trainers taking the programme will learn by visiting companies, by discussing with peers (even at distance), by exploiting Design Thinking and Instructional Design techniques, by exchanging views with experts and professionals, and by "seriously" playing.

Main expected results are:

- more skilled VET teachers and trainers;
- improved quality of learning, hence better employability of students and attractiveness of VET;

- increased and stable cooperation between training providers, teachers/trainers and enterprises;
- availability of sustainable tools, transferable to other economic sectors and other European countries.

Figure 1 synthesizes the project concept and model.

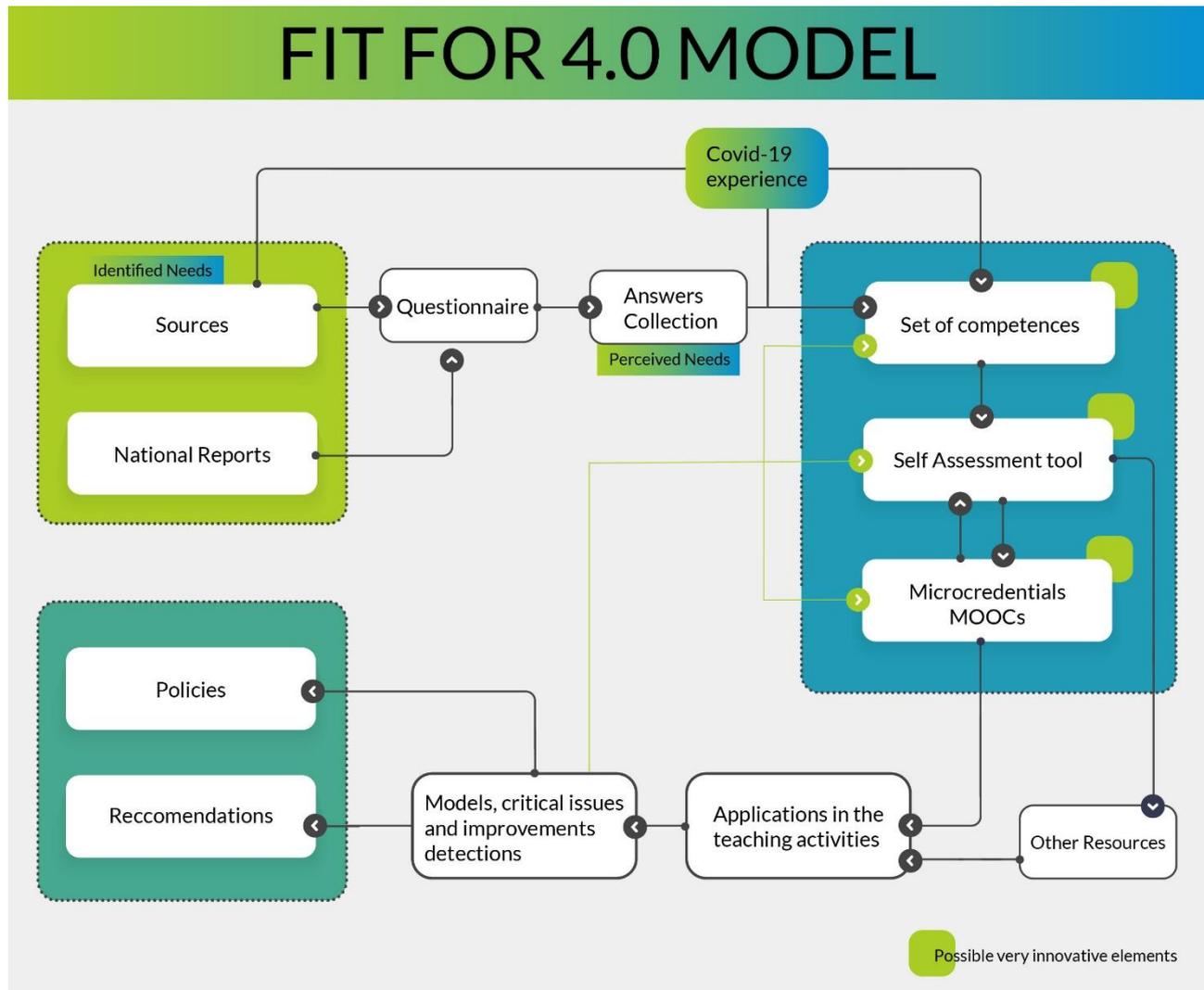


Figure 1 - The Fit for 4.0 model

2. The training pathway

2.1. The development process

The goal of the activities carried out was to define and describe the Training Units (TU) of the training pathway for teachers and trainers, to be implemented into a MOOC in the subsequent stages of the project. At this stage, the content and training material were not an issue. Rather, the focus was on learning outcomes.

Partners started from the set of 8 non-technological competences identified and described in terms of knowledge, skills and attitudes (KSA) in the previous phases of the project. They are listed in figure 2. In fact, teachers and trainers interact and work in an underpinning technological/digital context, with a *didactic* aim, experiencing lifelong learning and own *personal* development, with an overall view to *strategic* continuous improvement: that is why, we assigned their competences to one of these three domains. Domains are level-independent (or cross-level), as they define fields of expertise, rather than measuring at what extent a competence is mastered. Boundaries of domains overlap and require adaptation in different contexts: in case a competence can refer to more of them, we allocated it to the best-fitting one.

		Technological/digital underpinning context	
		title	
domain	Didactic	D.1. – Design learning experiences with a 4.0 approach	
		D.2. – Implement learning experiences with a 4.0 approach	
		D.3. – Assess learning experiences with a 4.0 approach	
		D.4. – Interact in learning environments 4.0-oriented	
	Personal	P.1. – Keep oneself up-to-date	
		P.2. – Information and knowledge management	
	Strategic	S.1. – Process improvement	
		S.2. – Innovating	

Figure 2 – The eight competences investigated

With a view to design a learning pathway for teachers and trainers, partners started by “translating” the overall set of KSA covered by the 8 competences in figure 2. into learning objectives: that included grouping, rewording, synthesizing.

Learning outcomes were then “clustered”, based on logical proximity and expected learning effectiveness and efficiency. Gaps and overlapping among learning outcomes were checked, to define the final core of a number of training units. Each unit was then given a title and a sequence number. The “first” TU in the sequence was numbered “0”, as it stands as an

introduction to all other units. More, the sequence number proposed follows a logical order in the learning process, but should be considered just as a reference, as there is no requirement to take the units in a row, as further explained at paragraph 2.2.

Table 1 shows the set of training units.

<i>n.</i>	<i>title</i>
TU0	Introduction & developing your own expertise
TU1	My field in relation to 4.0
TU2	Designing learning environments and learning experiences with a 4.0 approach
TU3	Implementing learning experiences with a 4.0 approach
TU4	Assessing learning experiences with a 4.0 approach
TU5	Innovating: ideas for teaching and learning
TU6	Training for work placement and interacting with stakeholders

Table 1: the set of Training Units

More, table 2 brings together Figure 2 and Table 1, showing how TUs cover the initial set of competences.

<i>TU</i>	<i>Competences covered</i>							
	<i>D.1</i>	<i>D.2</i>	<i>D.3</i>	<i>D.4</i>	<i>P.1</i>	<i>P.2</i>	<i>S.1</i>	<i>S.2</i>
TU0 - Introduction & developing your own expertise								
TU1 - My field in relation to 4.0								
TU2 - Designing learning environments ...								
TU3 - Implementing learning experiences ...								
TU4 - Assessing learning experiences ...								
TU5 - Innovating: ideas for teaching and learning								
TU6 - Training for work placement and interacting ...								

Table 2: competences covered by Training Units

It is pretty evident that each TU covers more than one competence, and that each competence is covered by more TUs. This redundancy comes natural, as some TUs cover a part of KSA for a given competence, and other TUs can cover other parts of KSA linked to the same competence. The redundancy is also intentional, wherever the same KSA needed to be treated from different points of view, or to be recalled and deepened.

After defining the number, titles and learning outcomes for the TUs, partners agreed upon a structure for their description, a number of explanatory fields (see next paragraph). Each unit was then allocated to a group of partners (one being responsible for the final description of the TU, and the others cooperating), who developed it following a common template.

The draft version of each TU was then peer reviewed by other partners than the developers, following this sequence:

- self-assessment by the TU authors
- peer review by 2 partners, based on the same questions as the self-assessment
- on-line meeting between authors and reviewers
- based on feedback from peer review, possible adjustments to single TUs
- validation of output by all partners.

The final version of the TUs is shown at paragraph 2.3.

The role of each partner in the development and review process is in Appendix 1.

2.2. The structure of the Training Units

Each Training Unit is characterised by a set of attributes that clearly identify it, describe it and highlight the relevant aspects concerning its delivery. The choice of these attributes was made on the basis of two needs, which were translated into two objectives for the partners:

1. in terms of **training**: to provide teachers and trainers with a clear indication of the purposes of each Training Unit, that is, the results that can be achieved once the unit has been passed, and a series of guidelines (concerning content, methods and supporting tools) useful to contribute to the best possible implementation of the unit;
2. in terms of **transferability**: to favour either the recognition of competences acquired/improved through the implementation of the units, and the adaptation to other countries/contexts.

One choice was added to the above objectives: the **non-exhaustivity** of the indications provided for each Training Unit. All information about content, recommended training methods, trainer and learner support, duration, etc., should be understood as suggestions, rather than instructions, and in many cases were intentionally left general. Basically, the guiding criterion here was providing the necessary and sufficient information for the design and implementation of the TUs, once the learning outcomes had been defined in detail. In other words, this is **one** possible implementation model, rather than **the** model.

From the above factors, the structure of the TUs was created. Each Training Unit is therefore characterised by:

Number

This is a progressive number given to TUs, just for reference in the pathway list.

Title

This is the name of the TU, which identifies it clearly for practical purposes.

Short description

This is a few sentences to allow learners quickly understand what is the TU about.

Links with other Training Units

These identify the “position” of the TU within a possible complete training pathway and its relationship with other parts of the wider programme. It is worthwhile reminding, however, that each TU is

designed to be self-consistent, and could be taken independently from the rest of the pathway, depending on learner needs.

Learning Outcomes

What the learner must demonstrate to have acquired, to “Pass” the TU (and the activities he/she must be able to carry out on the job).

Content

This is the description of the subjects dealt with in the TU.

Suggested delivery methods and tools

This is a synthetic description of recommended TU delivery methods (lecture, laboratory, work placement, distance learning, self-training, etc.). This description is an outline and does not contain much detail, allowing the teacher to adopt a wide range of methods and tools, depending on the learners and the context.

Suggested assessment methods

This is a synthetic description of how the achievement of learning outcomes could be measures. Again, this is a general description and without much detail, in order to allow the teacher to use a flexible approach to the assessment.

Prerequisites

These are training-type pre-requisites or competences needed to profitably access the TU. These are orientative rather than prescriptive, intended to inform learners about what is required in order to get the most out of the TU.

Suggested duration

Expressed in hours, has an indicative value as a suggestion. It is up to the teacher, according to the specific context, to fix the effective length of the training action.

2.3. The set of Training Units

Here below the 7 Training Units developed by partners are described. Altogether, they build a comprehensive training pathway, which will be implemented in a MOOC in the next phases of the project.

However, it is worthwhile setting two remarks:

1. each training unit was designed to be self-standing, that is, each unit could be delivered or taken on its own, as an independent training module;
2. these units will be conveyed in a MOOC, but that is definitely not the only way to deliver them: trainers of trainers can choose any means they deem fit for their learners, as what we introduce here is basically a framework and a supporting tool.

TU0 – Introduction & developing your own expertise

Number	TU0
Title	Introduction & developing your own expertise
Short description	This TU introduces learners to the full Fit for 4.0 pathway.
Links with other Training Units	None directly. However, this TU is meant as the introduction to the whole training pathway, so it is recommended to follow it as the first learning step.
Learning Outcomes	<p>TU4_LO1. The teacher/trainer is able to quote the most renown learning theories and the most used teaching methods, describing the strengths and weaknesses of own skills and qualifications.</p> <p>TU4_LO2. The teacher/trainer is able to define and implement a plan to achieve goals set</p> <p>TU4_LO3. The teacher/trainer is able to display adaptability (to changes, new situations and contexts, etc.) and flexibility (in order to cope with them)</p> <p>TU4_LO4. The teacher/trainer is able to analyze information and learning processes through different methods</p> <p>TU4_LO5. The teacher/trainer is able to search, select and find relevant information about the subject.</p> <p>TU4_LO6. The teacher/trainer is ready to share knowledge and teaching materials and gain further insight through this sharing.</p>
Content	<p>TU4_C1. What is this unit for? What are the goals and scope of the Fit for 4.0 Training Pathway?</p> <p>TU4_C2. Main learning theories and teaching methods for basic understanding of own learning and teaching approach</p> <p>TU4_C3. Use of basic project management strategies and tools to define and implement goals (Learning Outcomes)</p> <p>TU4_C4. Planning flexibility (already having in mind an alternative scenario to achieve the goals set)</p> <p>TU4_C5. Possible methods to analyse information and learning processes</p>

	TU4_C6. Incentives to knowledge sharing
<i>Suggested delivery methods and tools</i>	Lectures, case studies, quizzes, self-assessment tasks
<i>Suggested assessment methods</i>	Peer review with colleagues
<i>Prerequisites</i>	None
<i>Suggested duration</i>	6 hours (including the peer review)

TU1 – My field in relation to 4.0

<i>Number</i>	TU1
<i>Title</i>	My field in relation to 4.0
<i>Short description</i>	This TU provides for a short introduction to Industry 4.0, helping learners to understand how the subject(s) they teach relate to that topic and how they can be best help their students in understanding such relationships.
<i>Links with other Training Units</i>	Upstream: TU0 Downstream: all other TUs.
<i>Learning Outcomes</i>	<p>TU2_LO1. The teacher/trainer is able to give an overview on the Industry 4.0 phenomenon (both at the international and national perspective) describing its main characteristics and implications, using a language appropriate and level of details suitable to her/his interlocutors (students, pupils, colleagues, parents, institutions...).</p> <p>TU2_LO2. The teacher/trainer can list and describe the main peculiarities of Industry 4.0 tools and techniques, in particular related to her/his field</p> <p>TU2_LO3. The teacher/trainer is able to build plans for introduction of Industry 4.0 tools and techniques in areas where they are not currently being used.</p> <p>TU2_LO4. The teacher/trainer is able to work with students to build plans for introduction of Industry 4.0 tools and techniques in areas where they are not currently being used</p> <p>TU2_LO5. The teacher/trainer is able to work with local industries to develop live projects that enable students to help plan for use of Industry 4.0 tools and techniques in real-life situations</p> <p>TU2_LO6. The teacher/trainer is able to describe Industry 4.0 concepts to students and colleagues from outside of their native country</p>
<i>Content</i>	<p>TU1_C1. How to describe Industry 4.0 to a wide range of people, nationally and internationally (LO1, LO2, LO6)</p> <p>TU1_C2. How to plan, with a range of others, for the use of Industry 4.0 tools (LO3, LO4)</p> <p>TU1_C3. How to introduce, with companies, Industry 4.0 tools into work situations for use by students (LO5)</p>

<i>Suggested delivery methods and tools</i>	Development of simple, multimedia overviews of concepts, examples of industry contexts where tools could be used, sample cases of actual use of I4.0 tools, critiqued by company users (if possible). Here the teacher/trainer would might use local case studies rather than a generalized set of examples.
<i>Suggested assessment methods</i>	Multiple-choice quizzes in the MOOC, short case study presentation, including tools descriptions and description of planning for actual use of Industry 4.0 tools
<i>Prerequisites</i>	The teacher/trainer must have or establish, relevant industry contacts
<i>Suggested duration</i>	5 hours

TU2 – Designing learning environments and learning experiences with a 4.0 approach

<i>Number</i>	TU2
<i>Title</i>	Designing learning environments and learning experiences with a 4.0 approach
<i>Short description</i>	This TU deals with the design of learning experiences and learning contexts 4.0-oriented, that is, favouring the understanding of I4.0 organisational and technological implications and the adoption of varied, digital, work-based methods, techniques and tools by teachers and trainers.
<i>Links with other Training Units</i>	Upstream: TU0, TU1 Downstream: TU3, TU4, TU6
<i>Learning Outcomes</i>	<p>TU2_LO1. Target group The teacher/trainer, taking into consideration the learners/users,</p> <ul style="list-style-type: none"> • will be able to describe characteristics and define profiles of her/his target groups; • will be able to analyse general learning needs of her/his target group (within Industry 4.0 contexts) and individual learning needs of her/his students. <p>TU2_LO2. Pedagogical approach The teacher/trainer will be able to design student-centred learning experiences within Industry 4.0 perspective; in detail:</p> <ul style="list-style-type: none"> • will demonstrate to be familiar with pedagogical approaches suitable for Industry 4.0 context; • will be able to define learning outcomes that support learners' skills development in Industry 4.0 and soft/cross skills; • will be able to sequence the designed learning experiences in engaging and meaningful phases suitable for different learning environments; • will be able to create a realistic timeframe for the designed learning experience. <p>TU2_LO3. Learning activities</p>

	<p>The teacher/trainer will be able to create meaningful learning activities that promote the achievement of learning objectives. In detail:</p> <ul style="list-style-type: none"> • will be able to co-design learning experiences with colleagues and work-life representatives; • will be able to design learning activities that are engaging, simulate authentic work tasks and support the development related to Industry 4.0 and soft/cross skills; • will be able to modify activities in terms of students' individual learning needs and supporting communal information building and competence sharing. <p>TU2_LO4. Learning resources and tools</p> <p>The teacher/trainer will be able to select appropriate learning resources and tools in terms of the set learning objectives and a selected learning environment. In detail:</p> <ul style="list-style-type: none"> • will be able to select suitable learning environments taking into consideration elements like physical, psychological, social and digital; • will be able to choose learning recourses suitable for the target group; • will be able analyse resources' sensitivity, equality and appropriateness within the Industry 4.0 context; • will be able to communicate with working-life stakeholders to enable authentic resources e.g. videos from product manufactures.
<i>Content</i>	<p>TU2_C1. Learner-centred pedagogical design process</p> <p>TU2_C2. Student-Centred Instructional Strategies</p> <p>TU2_C3. Designing learner-centred learning outcomes and activities</p> <p>TU2_C4. Ubiquitous learning environment, digital tools and learning resources</p> <p>TU2_C5. Co-design and collaboration.</p>
<i>Suggested delivery methods and tools</i>	<p>This proposal's methodological aspects are rooted in the learner-centred learning design approach. It as an iterative process and focuses on the quality of learning. This approach views learners as active agents bringing their own knowledge, past experiences, education, and ideas that should be employed to elevate both planning and implementation of learning.</p> <p>Teachers / trainers are encouraged to co-design a learning experience, which includes intended learning outcomes, learning activities and learning environments, and to share their designed learning experience to inspire others.</p>
<i>Suggested assessment methods</i>	<p>Continuous and transparent assessment by using self- and computer-supported assessment methods and tools.</p>
<i>Prerequisites</i>	<p>The teacher/trainer should be familiar with ILOs of TU0 and TU1.</p>
<i>Suggested duration</i>	<p>5 hours</p>

TU3 – Implementing learning experiences with a 4.0 approach

Number	TU3
Title	Implementing learning experiences with a 4.0 approach
Short description	This TU deals with the ability to deliver learning chances through methods mirroring the environment learners will find at work, in a 4.0 context. This includes using innovative strategies and tools, and paying special attention to a variety of soft skills.
Links with other Training Units	Upstream: TU0, TU2 Downstream: TU4, TU6
Learning Outcomes	<p>TU3_LO1. TU3_LO1 The teacher/trainer, aware of her/his role of teacher-designer of learning experiences, is able:</p> <ul style="list-style-type: none"> • to execute on a learning program/process in its entirety; • to analyze his/her own teaching approach, modifying and improving it; • to stop an activity or change a plan, if the students are not well-engaged, not ready to deal with the situation, distracted by something external. <p>TU3_LO2. The teacher/trainer, taking into consideration the important role of the outside world, is able:</p> <ul style="list-style-type: none"> • to interact with all the actors of the learning process; • to create interactions, connections and links among the subjects; • to stimulate and manage the interactions among other stakeholders, like the institutions and the labour market representatives; • to collect input by all actors involved in the learning process. <p>TU3_LO3. The teacher/trainer is able to identify -at every stage of the learning process- all the components of the learning experience (subjects, activities, contents, channels and the outside world) and their role for the learning experience of each student.</p> <p>TU3_LO4. The teacher/trainer is able to share with the class the learning outcomes in a clear and specific way, so that students could be involved and engaged in the learning process and aware of the final outcomes.</p> <p>TU3_LO5. The teacher/trainer, interpreting his/her teaching as creating student-centred learning processes, is able:</p> <ul style="list-style-type: none"> • to choose the right tools and channels to work and communicate, • to schedule the activities and keep the planning, • to take into consideration the different students' skills and to ensure equal access to his teaching. <p>TU3_LO6. The teacher/trainer, is able to carry out active learning activities:</p>

	<ul style="list-style-type: none"> • by creating positive learning contexts where students are encouraged to acquire new knowledge, abilities and competences, participating and collaborating with each other; • by involving students in different situations, ranging from working individually to working in pairs or in groups to carry out an assignment, to explore an environment or a situation, to discuss about a topic; • by developing students' skills like autonomy, creativity, problem solving, critical thinking, collaboration, communication, negotiation and active listening. <p>TU3_LO7. The teacher/trainer is able to use:</p> <ul style="list-style-type: none"> • the time in the classroom to discuss problems, answer questions, propose activities designed to activate the classroom; • the time at home to make students study the course materials (book, pdf, videos...), adopting the “flipped classroom” approach. <p>TU3_LO8. The teacher/trainer is able:</p> <ul style="list-style-type: none"> • to give to the students all the right information to let them perform the task; • to display contents that help the learners combine new information with previously learned information; • to support them during the course according to different needs. <p>TU3_LO9. The teacher/trainer is able:</p> <ul style="list-style-type: none"> • to monitor the students’ progress thorough different methods and tools, encouraging them to make progress • to provide guidance and feedback to students.
<p><i>Content</i></p>	<p>TU3_C1. The learning process: planning, delivering, changing, improving</p> <p>TU3_C2. The stakeholders: identification of needs and resources and collaboration</p> <p>TU3_C3. The learning experience: subjects, activities, contents, channels and the outside world; involvement, engagement, active learning; soft skills; monitoring and feedback.</p>
<p><i>Suggested delivery methods and tools</i></p>	<p>The methodological approach proposed is based on the importance on the experience and it follows the classical Kolbe’s cycle steps:</p> <ul style="list-style-type: none"> • Concrete experience: presenting a concrete experience (case study) • Reflective observation: making teachers/trainers reflect on the case study presented starting to select the essential factors, understand the sequences and its key features. • Abstract Conceptualization: the teachers/trainers can now start drawing general conclusions from the observation of the experience • Active experimentation: the teachers/trainers apply the concepts learned in new real or realistic contexts.

	<p>Trainers could well make use of:</p> <ul style="list-style-type: none"> • Videos • Case studies to propose examples and experiences in terms of replicability • Texts and pdf • Infographics • Individual activities, peer learning to encourage students to put into place their knowledge and to develop abilities and competencies • Activities focused on getting to know new tools for enhancing students' interaction (useful especially for the extended classroom)
<i>Suggested assessment methods</i>	<p>Formative assessment: non-graded activities (quizzes, reflective quizzes and activities, peer evaluation)</p> <p>Summative assessment: graded quizzes, from 5 to 10 questions that formally evaluate the level of knowledge of the user after having followed this training unit. (Also necessary to get the certificate at the end of the MOOC).</p>
<i>Prerequisites</i>	The teacher/trainer should be familiar with ILOs of TU0, TU1 and TU2.
<i>Suggested duration</i>	5 hours

TU4 – Assessing learning experiences with a 4.0 approach

<i>Number</i>	TU4
<i>Title</i>	Assessing learning experiences with a 4.0 approach
<i>Short description</i>	This TU deals with the ability to assess learning in the perspective of using the acquired knowledge and skills in a work, complex, digital, interconnected environment.
<i>Links with other Training Units</i>	All other TUs.
<i>Learning Outcomes</i>	<p>TU5_LO1. The teacher / trainer is able to describe and monitor the student's learning;</p> <p>TU5_LO2. The teacher / trainer is able to assess and examine the risks involved on changing learning modules / units, in the student's path, and to define results-oriented strategies;</p> <p>TU5_LO3. The teacher / trainer is able to report and share with the students the findings of regular reviews and discuss the results of these assessments, ensuring the use of common assessment criteria for each of the learning modules / units);</p> <p>TU5_LO4. The teacher / trainer is able to evaluate learning regularly, defining specific moments of evaluation (diagnostic evaluation; initial and intermediate monitoring; final</p>

	<p>evaluation) and using tools for digital assessment and distance assessment (forms, whiteboards, apps, etc.);</p> <p>TU5_LO5. The teacher / trainer is able to select the assessment methods that best suit students and learning contexts (including self-assessment and peer assessment);</p> <p>TU5_LO6. The teacher / trainer is able to select the assessment tools that best adapt to students and learning contexts;</p> <p>TU5_LO7. The teacher / trainer is able to use digital methodologies of monitoring and management the projects (includes those related to I4.0);</p> <p>TU5_LO8. The teacher / trainer is able to justify the methodologies of management the projects and the assessment tools chosen for the purpose.</p>
<i>Content</i>	<p>TU5_C1. Understanding the different assessment techniques and their scope;</p> <p>TU5_C2. General knowledge of the learning outcomes and contents of other modules / learning units (if any) that make up the student's path;</p> <p>TU5_C3. Knowledge and definition of expected individual and collective learning outcomes, to each the learning modules / units;</p> <p>TU5_C4. Tools for digital assessment and distance assessment and their scope context (field of application, advantages and disadvantages);</p> <p>TU5_C5. Identification and application of innovative assessment strategies;</p> <p>TU5_C6. Adaptation of the available resources to the evaluation process;</p> <p>TU5_C7. Process management methodologies (for example, classic, Agile, XPM, Scrum, lean, Kanban, etc.) and their relationships with I4.0 (for example, big data, IoT, etc.)</p>
<i>Suggested delivery methods and tools</i>	The training program should include a component for learning content through an expository and interrogative method (viewing videos, reading documents, case studies, questionnaires, quizzes, tasks, etc.) and the use / experimentation of various digital tools (forms, whiteboards, apps, etc.).
<i>Suggested assessment methods</i>	Multiple choice quizzes; forms; videos with tutoring sessions; peer review with colleagues.
<i>Prerequisites</i>	None
<i>Suggested duration</i>	5 hours

TU5 – Innovating: ideas for teaching and learning

Number	TU5
Title	Innovating: ideas for teaching and learning
Short description	This TU deals with the ability to rely on experience, but at the same time to bring innovation and suggest changes in the teaching and learning processes.
Links with other Training Units	All other TUs.
Learning Outcomes	<p>TU6_LO1. The teacher / trainer is able to describe and monitor the student's learning;</p> <p>TU6_LO2. The teacher/trainer is able to map in a clear overview the trends in society, technology and labor world</p> <p>TU6_LO3. The teacher/trainer is able to set up a network of people working in innovative organizations/companies</p> <p>TU6_LO4. The teacher/trainer is able to set up a network of people/colleagues using innovative teaching methods</p> <p>TU6_LO5. The teacher/trainer is able to use during his/her training course(s) innovative methods (like for example design thinking, co-creation and teacher/trainer-centered innovation)</p> <p>TU6_LO6. The teacher/trainer is able to transfer innovation into learning opportunities</p> <p>TU6_LO7. The teacher/trainer is able to create a proof of concept for an innovative educational track/course</p> <p>TU6_LO8. The teacher/trainer is able to stimulate critical thinking during the learning process</p> <p>TU6_LO9. The teacher/trainer is able to look critically at innovation and decide if the innovation contributes to a determined strategy /organization/curriculum/learning process</p>
Content	<p>TU6_C1. Understanding the different assessment techniques and their scope;</p> <p>TU6_C2. Evaluation of the environment: trends in society, technology and labor market (LO1)</p> <p>TU6_C3. Active networking (intra and extra muros) in order to set up a sustainable cooperation (LO2 & LO3)</p> <p>TU6_C4. Innovative teaching methods: Design Thinking, Hackaton, speed dating (on & offline), real life business cases, co-creation, teacher/trainer-centred innovation (LO4 & LO5)</p> <p>TU6_C5. A proof of concept for an innovative educational track/course (LO6)</p> <p>TU6_C6. Critical reflection on innovation in a determined strategy /organization/curriculum/learning process (LO7 & LO8)</p>
Suggested delivery methods and tools	The teacher/trainer could deliver the theoretical description of each topic (max 1 page + links to interesting sites/youtube channels/extra information), and then invite teachers/trainers to apply and implement

	the theoretical knowledge into their learning environment, then report and peer review.
<i>Suggested assessment methods</i>	Formats that could help the trainer obtain the skills in order to create an innovative learning environment. Rather than a test, that should be a toolbox with useful documents, like a roadmap, to help the trainer to transfer the knowledge into his/her daily lessons.
<i>Prerequisites</i>	Open-mindedness.
<i>Suggested duration</i>	5 hours

TU6 – Training for work placement and interacting with stakeholders

<i>Number</i>	TU6
<i>Title</i>	Training for work placement and interacting with stakeholders
<i>Short description</i>	This TU gives an opportunity for trainers to develop soft skills for working with work placement in I4.0. The TU uses the “triangle” student - trainer-mentor as a starting point and focuses on how all three can be involved in planning, implementing and assessing work placement with a I4.0 perspective.
<i>Links with other Training Units</i>	All other TUs.
<i>Learning Outcomes</i>	<p>TU6_LO1. The teacher/trainer is able to identify suitable companies that matches the LO`s in the training programme</p> <p>TU6_LO2. The teacher/trainer is able to match student with the appropriate company, based on student`s profile/personal goals and company`s need for competence</p> <p>TU6_LO3. The teacher/trainer is able to prepare both student and mentor/trainer in workplace for their respective roles during the work placement, i.e. communicating practical information, explaining how LO`s will be assessed, and setting the right expectations</p> <p>TU6_LO4. The teacher/trainer is able to communicate with student and mentor/trainer on-line and/or by visiting the workplace</p> <p>TU6_LO5. The teacher/trainer is able to assess fulfilment of LO`s continuously based on dialogue with both student and mentor/trainer</p> <p>TU6_LO6. The teacher/trainer is able to evaluate work placement in dialogue with both student and mentor/trainer</p> <p>TU6_LO7. The teacher/trainer is able to apply continuous improvement techniques, i.e. PDCA, to work placement process to adjust and enhance the work placement experience</p>
<i>Content</i>	<p>TU6_C1. Methods to approach companies and involve them in learning design and assessment.</p> <p>TU6_C2. Steps to be taken before, during and after a work placement.</p>

	<p>TU6_C3. Co- design of work placements with companies and students.</p> <p>TU6_C4. Co-assessment of work placements with companies and students.</p> <p>TU6_C5. Continuous improvement techniques (e.g. PDCA).</p>
<i>Suggested delivery methods and tools</i>	Before-During-After work placement (WP); short films with questions to reflect on. Films focus on best practice in preparing for WP, during WP and after WP. The objective of the unit is to create one's own checklist for work placement, based on the examples from the films
<i>Suggested assessment methods</i>	Multiple choice questions and creating a checklist for what to do before-during-after work placement in own organization.
<i>Prerequisites</i>	This unit is specially intended for trainers who are or will be responsible for planning, implementing and assessing work placement for students in vocational training.
<i>Suggested duration</i>	5 hours

3. Next steps

As described at Chapter 1, partners will convey this training pathway into a MOOC (Massive Online Open Course), which will then be tested by a selected number of teachers and trainers in the corresponding organisations. That test could bring to further adjustments to this document.

Appendix 1 – Partner roles

Many partners co-operated to the development and the peer review of the training units that build-up this training pathway. The table below summarizes each partner's role.

nr.	Title	Partners								
		IFOA	APH	BFI-OOE	EDUGEP	GTC	JAMK	NWRC	POLIMI-METID	ZBC
TU0	Introduction & developing your own expertise	DC		DL		PR	DC		PR	
TU1	My field in relation to 4.0	PR	PR	DC		DC		DL		
TU2	Designing learning environments ...	PR	DC	PR			DL		DC	
TU3	Implementing learning experiences ...	DC		PR			PR		DL	
TU4	Assessing learning experiences ...				DL	DC	DC		PR	PR
TU5	Innovating: ideas for teaching and learning		DL	DC		PR	PR		DC	
TU6	Training for work placement and interacting ...	DC	DC			DL			PR	PR

Legenda

DL = development leader

DC = development contributor

PR = peer reviewer

Partners

I.F.O.A. – Istituto formazione Operatori Aziendali (IT)

Artesis Plantijn Hogeschool Antwerpen (BE)

Berufsforderungsinstitut Oberösterreich (AT)

EDUGEP (PT)

EfVET – European forum of technical and Vocational Education and Training (BE)

Göteborgs Tekniska College AB (SE)

Jyväskylän Ammattikorkeakoulu (FI)

North West Regional College (UK-NI)

Politecnico di Milano – METID (IT)

Zealand Business College (DK)



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