STEP UP Supporting Tutor's Educational and Professional Upgrade

Comparative report B (IO1)

CATEGORISATION OF CASES OF APPARENT GOOD PRACTICES OF INNOVATIVE TRAINING UNITS FROM SPAIN, GERMANY, LITHUANINAN AND ITALY

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Erasmus+

As this is a collaborative report, the parts taken from the national reports are not marked as citations.

Content

1. Introduction

The Erasmus+ Project "STEP -UP Supporting Tutors Educational Profile" endorses a consistent strategy to impact on expected objectives and realises a wide range of activities, events and outputs (IO). In particular, the project involves the realization of four outputs; each of them is coordinated by a leader who, in cooperation with the other partners, contributes to achieve the project objectives.

Throughout this first output of the project, a comparative analysis, project partners gather apparent good practices and methodological approaches successfully implemented in Europe. The output produced will enable partners to build up the backbone framework for the STEP-UP Learning Training of Trainers (ToT).

This first output concerns the analysis and selection of good practices of technical, pedagogical competences and innovative approaches for the training of trainers, tutors and staff engaged into WBL practices:

- on comparing relevant aspects of VET-systems,

- on analysing apparent good practice of tutors at workplaces, where elements of digitalization are already in place,

- on analysing actual roles profile of in-company tutors involved in WBL path with particular focus on pedagogical competence requirements,

- on analysing of existing "train the trainer" approaches: outcomes of European projects, national strategies, existing training programs, and recommendations will be part of the respective national reports as well.

STEP UP moves from the assumption that there is a direct link between the effectiveness of Work-Based Learning (WBL) schemes and the pedagogical skills detained by all the different professionals involved in the planning, performance, follow up and evaluation of these paths.

Particularly important issues surround the development of pedagogical skills for in-company trainers in order to be adequately equipped for new or expanded roles – poorly skilled trainers or tutors hamper the effectiveness and quality of WBL in Europe and in particular in the four Countries (Lithuania, Italy, Spain, and Germany) targeted.

Teachers and trainers play an indispensable role in high quality apprenticeships. In-company trainers should be designated for apprenticeships, and they should be supported appropriately in this task. They should cooperate closely with vocational education and training providers and teachers to guide apprentices. A particularly important question surrounds the development of pedagogical skills for in-company trainers, although actions taken by Member States also demonstrate that also teachers may need support in order to be adequately equipped for new or expanded roles in respect of apprenticeships. Continuing professional development, however, often seems to be a neglected area for both teachers and in-company trainers. This aspect is a great challenge for quality in apprenticeships in terms of the cost for both public sector and enterprises of ensuring the supply of sufficiently competent teachers and trainers. Pedagogically skilled in-company trainers are a precondition for accreditation of WBL in some countries. This

cooperation should furthermore be supported by mutual and regular feedback mechanisms. Monitoring, how the learning outcomes are reached, should take place through continued monitoring systems, in which both teachers and in-company trainers cooperate. In particular, the assessment of apprentices during their time in the workplace should not be neglected even in school-based systems. In many countries, teachers and schools have been given a role in overseeing workplace assessment practices, but this task could also be assigned to the workplace. This suggests that the issue of assessment should be thoroughly reflected.

This project aims at developing and testing a new pedagogical model for preparation, training and support of in-company trainers. This aim is substantiated in the renewed role of in-company trainers who are involved in linking the two learning contexts (school and WBL). Additionally, step-up aims at a new way of accompanying companies; so that they can acquire more training skills and consequently greater formative responsibility.

With the expansion of apprenticeship, WBL and other dual education schemes supported by EU initiatives like the European Alliance for Apprenticeships (EAfA) and by reforms of national Technical Vocational Education and Training (TVET) systems promoted in many EU Member States (MS), more companies need support to ensure the development and improvement of competences, especially new digital competences of potential apprentice tutors.

Improving continuing professional development of in-company trainers, tutors and mentors has been on the EU policy agenda for some years but it becomes now even more important in the context of the increased policy attention (EC 2010-2012, Teachers and Training Matter EC 2018)

The country reports as well as the comparative report, focus on those primary aspects:

- Main structures of WBL Paths: aims, learning venues, alternation, and cooperation, stakeholders involved and their main tasks, funding and juridical issues, structures of curricula, examinations, approaches, involvement of research in development of the system
- Trainer/mentor training, how are trainers/mentors chosen, level of trainer/mentor training, quality standards/assessment
- Digitalized work and learning stations, learning potentials and tutoring activities
- Examples of apparent good practices of reacting within training of trainers/tutors on challenges induced by digitalization.

To reduce the amount of pages of this comparative report, findings on the latter two questions are published in separate documents.

2. Examples Germany

Mobile-Tech Platform (http://www.mobile-tech.eu/training-courses/)

Mobile-Tech Platform is an open self-learning platform for people involved in VET:

"MOBILE-TECH Platform is a learning space aimed at providing VET trainers, Head directors of VET centres, [mobile learning] (m-learning) experts and any interested party with an online tool to train their skills and competences to implement mobile learning practices in their daily teaching activity.

The platform is developed in the framework of the ERASMUS+ project "Technological Empowerment for VET trainers. An Open Educational Resource (OER) to train VET trainers in the design and use of m-learning methodologies", and is financed with the support of the European Commission."

(Mobile-Tech Training 2017.)

It was developed by INVESLAN (Spain), IBAF (Germany), Maristak (Spain), Epimorfotiki (Greece), Learnmera Oy (Finland) as well as Glasgow Clyde College (Great Britain) and has a user-friendly menu and design as can be seen in Figure 1.

Figure 1: Landing Page Mobile-Tech Platform

When entering the training area, the user can start the course from the beginning with Module 1 or can jump directly into the module he is interested in (Figure 2).

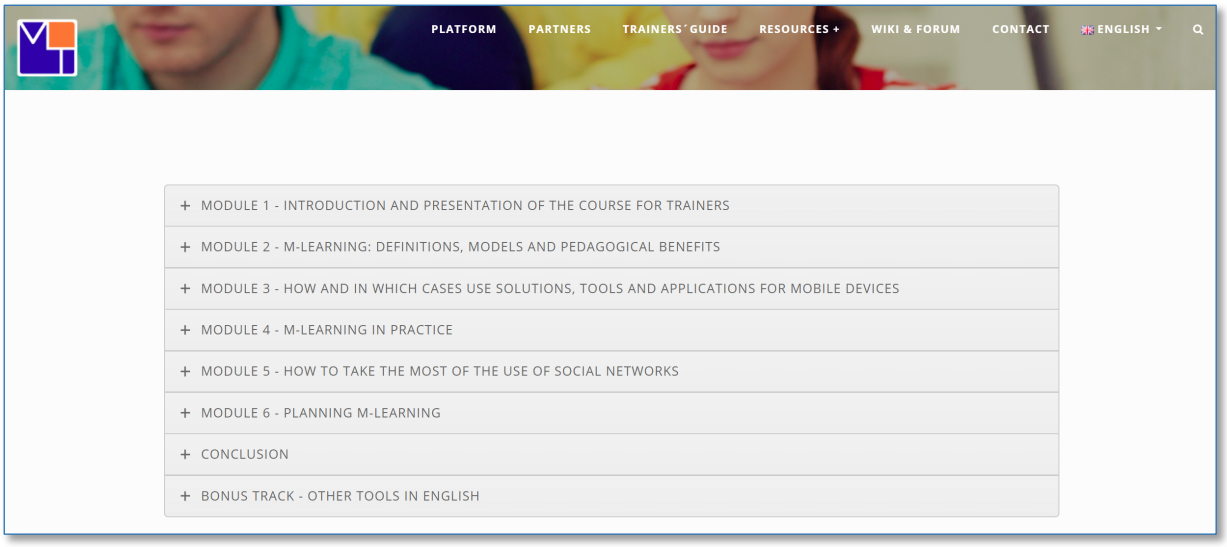


Figure 2: Training area of Mobile-Tech Platform

Apart from the modules the user can look at a bonus track and conclusions for the expected progression of mobile learning.

How and by whom are participants chosen?

Participants are not chosen by the partners involved in the platform as it is an open source training. Anyone interested in m-learning is welcome to do the training offered on the website.

On which level are the curricula of trainer/mentor training? (European)

As the course was developed by partners from Finland, Spain, Germany, Great Britain and Greece in an Erasmus+ Project, it is supposed that the Curricula is on a European level.

Draft sketch of the curricula (length, structure, content).

The course is divided into modules that follow a specific order. If one wants to complete the full course it is advised to follow this order. However, as it is a modular approach, one can also pick modules which are of interest. There are six modules provided in the course:

- Module 1: Introduction and presentation of the course for trainers
- Module 2: M-Learning: definitions, models and pedagogical benefits
- Module 3: How and in which cases use solutions, tools and applications for mobile devices
- Module 4: M-learning in practice
- Module 5: How to take the most of the use of social networks
- Module 6: Planning m-learning

A more precise description of the content in each module can be found in Table 1. Apart from the course, which is mainly structured in video-based lessons and PDF-tutorials, the platform furthermore offers a communication platform for sharing and exchanging experiences and good practices with others users through a Wiki and a forum. There is also a trainer's guide, which provides updated information of the content of the course. The estimated time for the course is 30 hours and it can be done in English, Finish, German, Greece and Spanish (Mobile-Tech Platform 2017).

Quality standards/Assessment

There is no assessment during or after the course. The course provides learning content for all modules, but the learning outcome is not assessed. However, in each module, there are learning objectives given so each participant can ask oneself after the module, if the learning objectives have been reached. Apart from that there are also learning objectives given, which should be accomplished by doing the whole course. One should be able to

- Revise the current situation and the future possibilities of the m- learning.
- Create a combination of good practices of m-learning in a European level.
- Provide a summary of different digital devices for the M-learning teaching.
- Provide an aid for trainers in order to improve their abilities with digital devices for learning and teaching processes.
- Improve the technological competence of the users to get used to work with digital devices with educational purposes.
- Encourage the self-learning and knowledge sharing
- Foster resources and experiences sharing about m-learning.

(Mobile-Tech Platform 2017)

Learning objectives for each module are sketched in Table 1.

Module	Content	Learning Objectives
1: Introduction and presentation of the course for trainers	Introduction Course structure M-Tech Trainers Guide Netiquette	No objectives
2: M-Learning: definitions, models and pedagogical benefits	M-learning: • Definition • Models & characteristics • Benefits • Experiences	1. M-learning concept´s definition. 2. Get to know the main M-learning models and characteristics. 3. Get to know the main pedagogical benefits of the M-learning. 4. Get to know the different experiences about the M-learning implementation.
3: How and in which cases use solutions, tools and applications for mobile devices	Applications classification based on Blooms' taxonomy Apps classification based on skills Examples of resources, tools and apps very useful for planning training activities	1. Get to know the main application environments of the m-learning. 2. Get to know different available tools. 3. Get to know different web sites about educative technology resources for the m-learning.

4: M-learning in practice	Tutorials for useful tools: • Collaboration tools (Dragon Dictation) • Learning Tools (Tynker, Duolingo, Aurasma, LearningApps, Interactive Video Editor) • Classroom Management (Google Classroom, Class Dojo) • Information Sharing (Creating QR Codes, Piktochart, Rules for Infographics, Storybird, Pinterest)	1. Get to know different collaborative tools for learning, class management and information sharing. 2. Review their use and technical specifications.
5: How to take the most of the use of social networks	Social networks Advantages and Disadvantages of social networks	1. Get to know web 2.0. 2. Get to know the benefits and risks of the use of social networks in educational environment. 3. Get to know 10 ways to implement social networks in the classroom.
6: Planning m-learning	Learning process planning: • Definition of learning objectives • Assessment of audience, experience, resources, technology and security • Choice of devices • Prototype building • Testing	1. Get to know the importance of planning in the m- learning. 2. Get to know different steps to follow in order to implement any m-learning style in classroom.

Table 1: Mobile-Tech Training course content description and learning outcomes (own representation based on Mobile-Tech Platform)

OpenDigiMedia (https://opendigimedia.de/)

OpenDigiMedia is a platform providing information and training on digitalization in production. The target group are skilled worker who want to get to know new technologies, trainers looking for Open Educational Resources (OER) content for further education courses or for persons planning to get a university degree in a related field. OpenDigiMedia is a project of the Leibniz University of Hannover and the agency for adult and further education and is financed by the European Social Fund and the state of Lower Saxony (Leibniz University Hanover o.A.)

In order to participate in a course and to access all materials, one needs to register on the website. The personal desktop of the platform is protected by a chosen password. It has a user-friendly structure and design and is available in German and partly in English. After entering in the personal space, there are several tabs one can choose (Figure 3). Apart from the course area which will be described further on in this paper, there are also free educational materials given, a content related dictionary, user instructions, consultation possibilities as well as related training courses, one can attend in person.

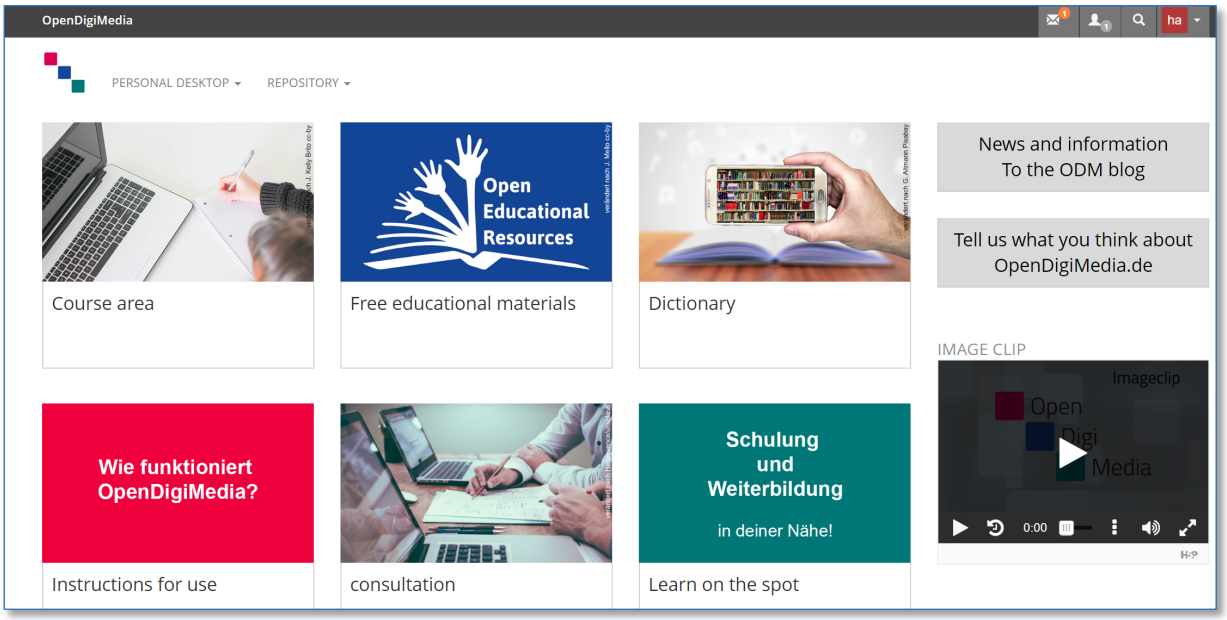


Figure 3: Landing Page OpenDigiMedia

Course area

In the course area there are several courses which can be attended (Figure 4).

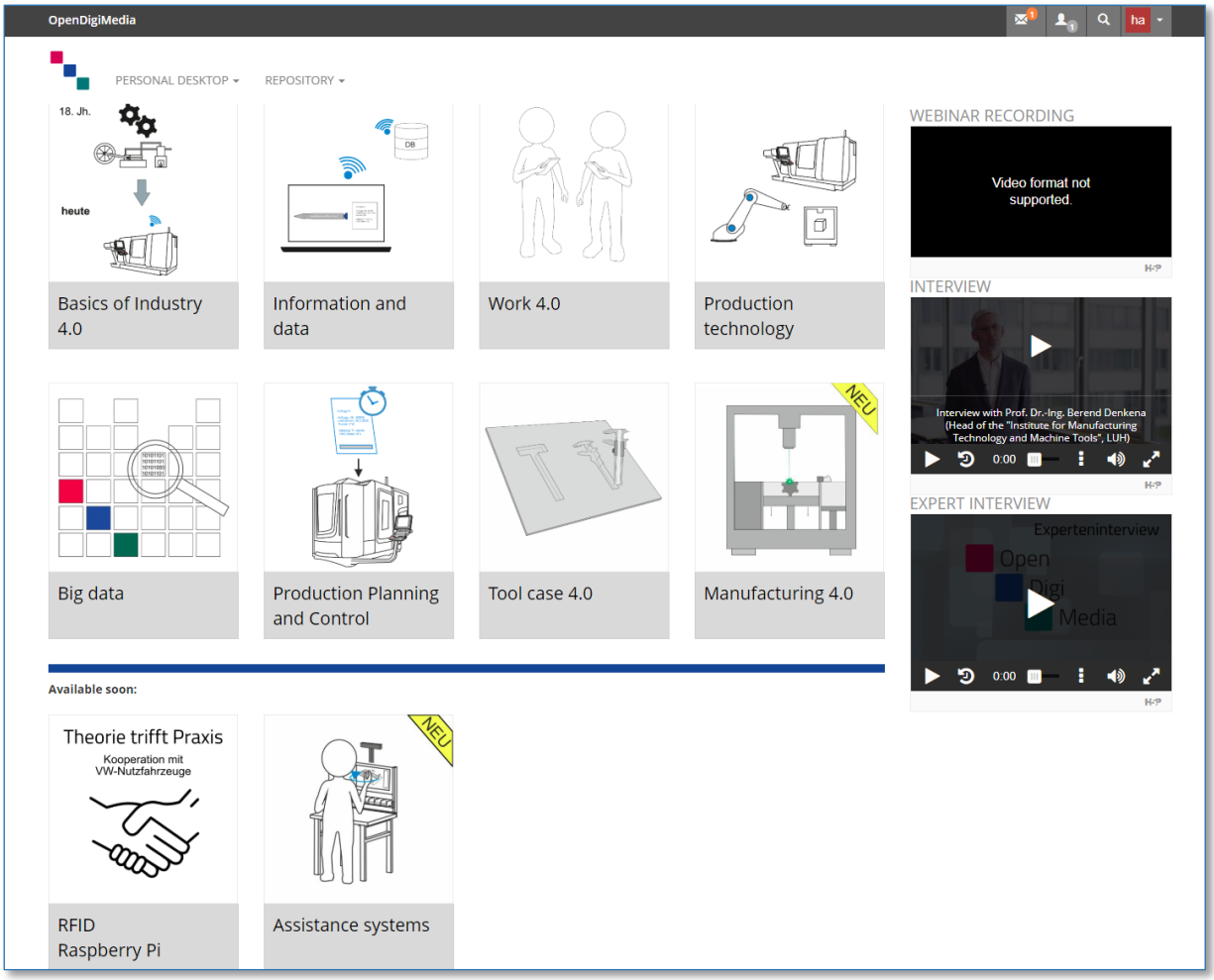


Figure 4: Course area of OpenDigiMedia

As stated above all courses are related to industrialization in production. For each course a test has to be passed at the end in order to get a participation confirmation.

How and by whom are participants chosen?

One can register for free and without being chosen by the partners. The project has been started in order to get employees from small and medium enterprises (SME`s] into contact with the topic "digitalization in production". Therefor anyone interested in this topic is allowed to participate.

On which level are the curricula of trainer/mentor training? (national)

The courses are developed by the Leibniz University of Hanover in cooperation with several partners from Lower Saxony, therefore it is supposed that the curricula are on regional level but open nationwide. However, as the courses are dealing with general topics which apply worldwide also users from other federal states of Germany can do the courses and get the participation confirmation. Apart from that the content is also relevant for other countries but as the content is mainly in German, only German-speaking users can benefit from it.

Draft sketch of the curricula (length, structure, content)

All courses provided by OpenDigiMedia have different topics and curricula. The lengths of the courses differ from 45 minutes up to 3 hours. The courses can be interrupted at any time and

continued at any point. In this chapter the description of the curricula is based on the course "Basics Industry 4.0".

Basics Industry 4.0 offers a first overview of digitalization in production and is dealing with the following questions: "How has manufacturing changed over the years?", "What are the key developments on the way to an intelligent factory?" and "What exactly do Industry 4.0 or cyber-physical systems mean".

The structure of the course is:

- Introduction to change in industry
- Data and information flows in the Smart Factory
- Outlook on the different technologies of Industry 4.0
- Introduction to Work 4.0

(OpenDigiMedia o.A.)

The course is supposed to take approximately 45 minutes to complete. The learning objectives after completing the course are that participants are able to

- Classify historical technical changes in the industry
- Explain the main causes of the increasing digitalization of production
- Classify data and information flows and their changes in the company
- Name basic technologies and methods of digitalization in production
- Explain the central effects of digitalization on the work of employees

As shown in Figure 5 the course has an overview page, where the user can find information on the course, individual learning progress as well as the test and course evaluation. Each course has a tutor, who can be contacted by email or partly by telephone.

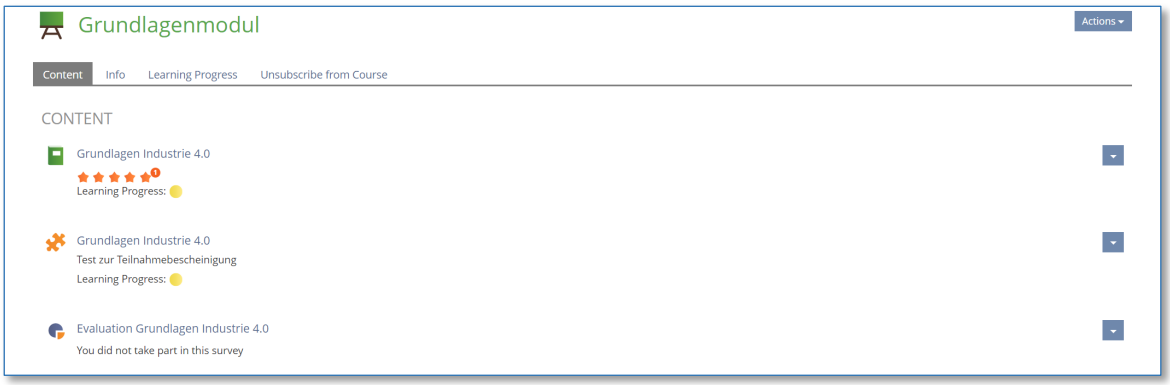


Figure 5: Course overview

Learning materials are either videos, PDF/odt-files, pictures or animated pictures. Sometimes it is possible to choose whether one wants to learn by watching a video or by reading a PDF. After each part there is a small test for a self-evaluation.

In Table 2 there can be found a sketch of the content.

Part	Content
Change in industry	Industrial revolutions The term Industry 4.0 Reasons for Digital Transformation • Individualization • Innovation • Shortening the product life cycle • Cost pressure
Date and information flows	Smart Factory Data and information flows in the smart factory
Digitalization technologies	Outlook on the different technologies of digitization Virtual tour of the general factory of "Mit uns Digital", the competence center for Lower Saxony and Bremen
Work 4.0	Work 4.0 • Work organization • Work activities • Man-machine relationship • Further education

Table 2: Sketch of content "Basics of industry 4.0" (own representation based on OpenDigiMedia o.A.)

Quality standards/Assessment

The courses are developed by a German university. This indicates that there is probably some scientific research involved and by that certain quality standards apply. However, apart from the information

*"[…] if you are a trainer looking **for quality-checked OER content** [emphasis by the author] for your further education courses or […]"* (OpenDigiMedia o.A.)

there is no further information on quality standards given on the website.

Assessment

There are two kinds of assessment on the website: one for the user after finishing the course and also a survey for evaluating OpenDigiMedia as seen in Figure 6.

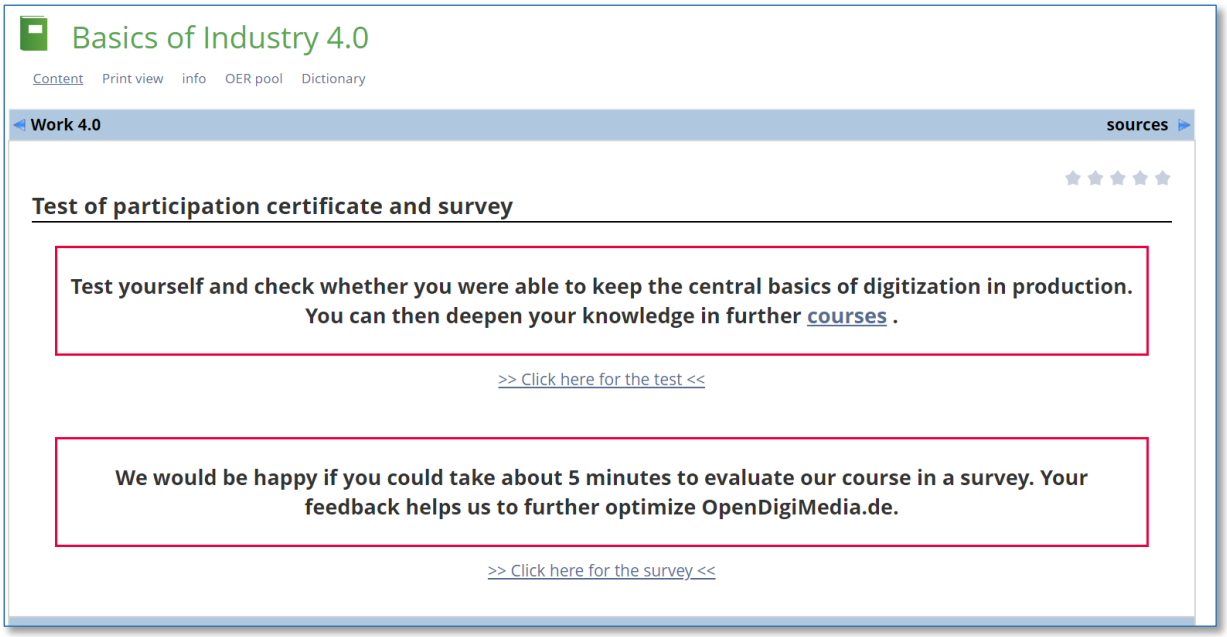


Figure 6: Assessment on OpenDigiMedia

The test is necessary in order to get a participation certificate. It consists of 9 questions related to the course content. For passing the test it is necessary to answer at least 75% correctly. If this percentage is reached, a personalized confirmation of participation can be downloaded. The test can be repeated as often as needed.

The evaluation of OpenDigiMedia deals with different areas:

- Course structure
- Reasons of the user for doing the course
- Previous knowledge of the user related to the course content
- Course content with regard to the workplace of the user
- Depth of content of the topics covered by the course
- Difficulty of the course, tests and final exam
- Provided media

The survey is used to improve the website as well as the contents of OpenDigiMedia.

Metals – machine tool alliance for skills

Picture 1: metals logo

Web-page: http://www.metalsalliance.eu/

e-learning: https://metals.mobil-lernen.com/en/

Available languages: EN, DE, IT, ES

Sector skill alliance, project number: 562464-EPP-1-2015-1-BE-EPPKA2-SSA

About the Project

The EU metalworking machine tool industry is a key enabling and advanced manufacturing sector supplying several industries including automotive, aerospace, energy and medical devices with customized, innovative and high-quality products. The sector is composed of 1,500 companies and 150,000 workers. Over 80% of EU metal working machine tool builders are an SME and most of the machine tool businesses are family-owned and established a few decades ago with the rise of CNC and CAD technologies.

The competitiveness of the sector is based on the knowledge, skills and competences gained through VET and work-based learning which are needed to design, produce, operate and maintain highly-customized, innovative and high-quality machines. Emerging technologies such as additive manufacturing provide new opportunities and challenges for the sector. To leverage such new technologies and seize the opportunities workers need to turn ideas into action with creativity and innovation. In the last decade, however, the sector is challenged with the shortage of skills with entrepreneurial skills and innovative mind-set, which hampers the competitiveness of the EU machine tools industry and the employability of workers.

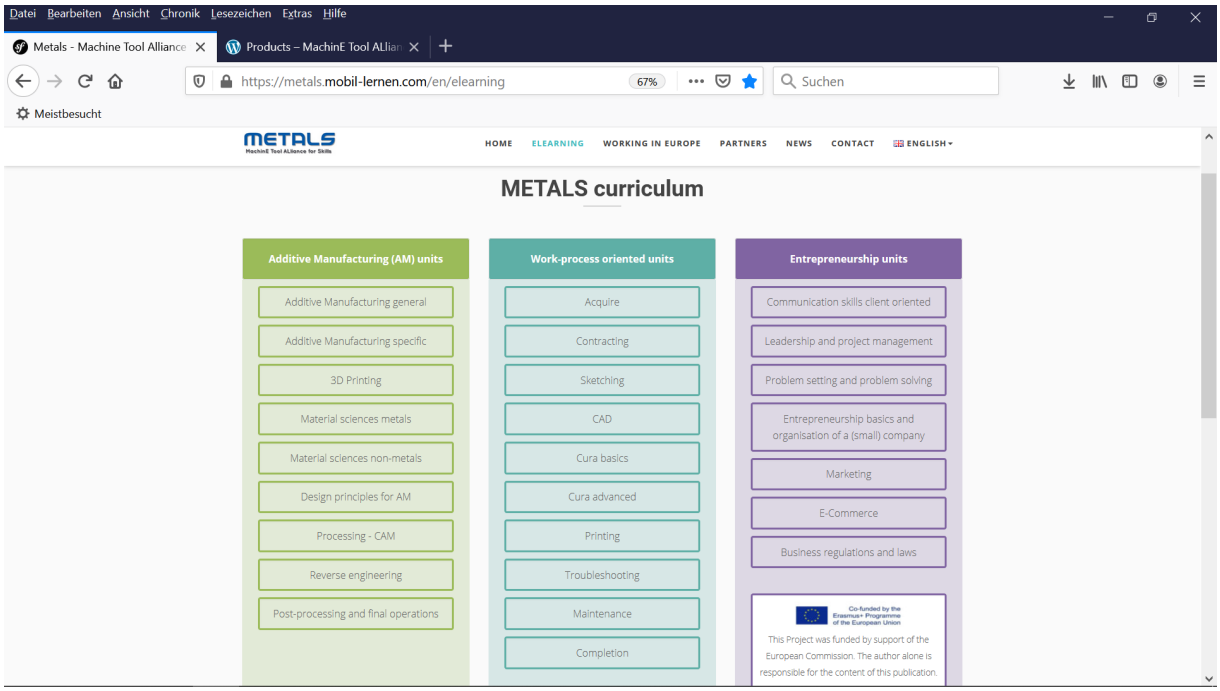
Challenges that were addressed:

The skills-related challenges of the EU machine tools industry are as follows:

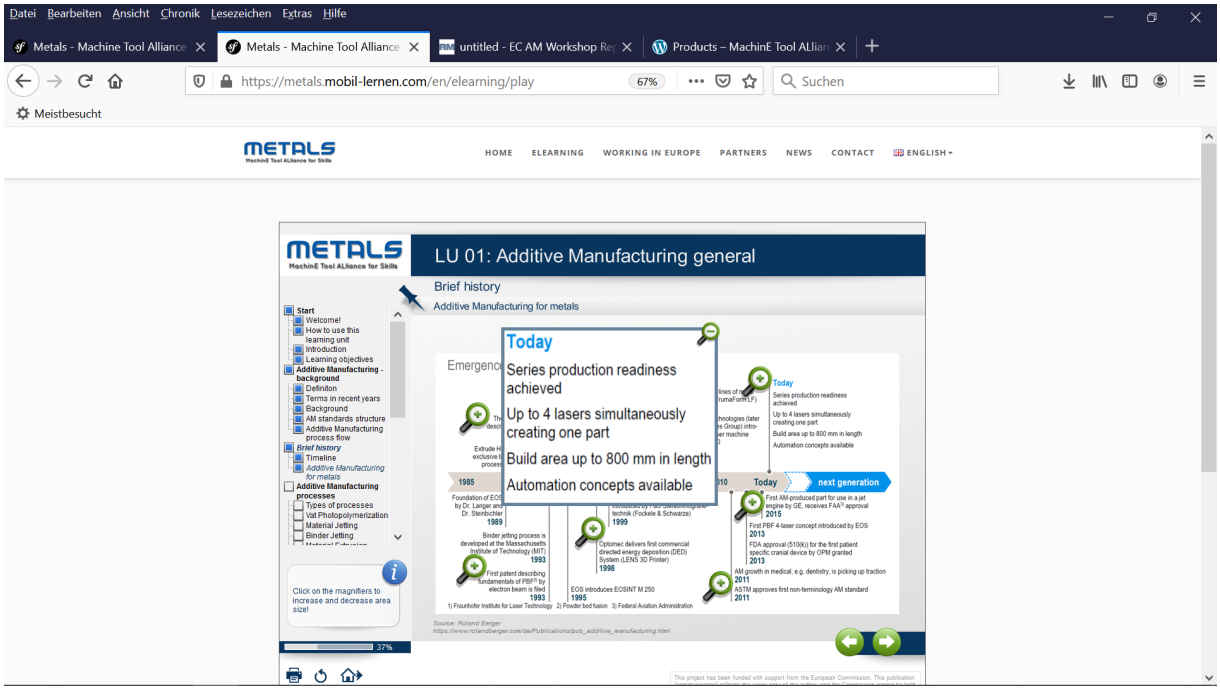
- VET learners and graduates do not possess the skills needed by the industry which causes unfilled posts and unemployment at the same time,
- cooperation between the VET providers and the industry is weak and VET providers are not necessarily informed about the skills needs of the sector,
- open educational resources (OER) are not well-integrated into teaching methods which blocks access to information,
- mobility of VET learners and workforce is low due to the lack of transparency and recognition in education and training,
- image of machine tool industry and VET in the sector is poor, making extremely difficult to attract new talent to the sector.

Main outcome:

27 interactive self-learning units, each one lasting approx.. 1 hour:



Picture 2: Metals curriculum



Picuture3: Screenshot from learning unit 1

Main target groups are apprentices and skilled workers from the sector. Platform and learning units are free for everyone, at the end of each unit is an assessment; if candidates reach more than 80% the unit is passed.

3. Examples Spain

First Example: GESTAMP ABRERA S.A.

The **GESTAMP ABRERA, S.A. (Barcelona)** factory has collaborated with the Salesians School in Sant Vicenç dels Horts (Barcelona) for many years, accepting student-trainees from High Level VET in Administration and Finance, Robotics and Industrial Maintenance studies. In addition, we have signed a framework agreement to carry our dual internships since the implementation of Dual VET in Spain (2012). In addition, since this year, they have accepted students of the Dual system from both courses.

This factory focuses its work on the production of components for the automotive industry by cold and hot extrusion. It is a very motorized factory and with technology from the latest generation, which means that the tutors of the Robotics and Industrial Maintenance students have to have continuous training in the latest technology.

Gestamp Abrera has factories on the five continents (120 factories in 21 countries), and given the training needs of their workers in the latest technologies, created the **Gestamp Technology Institute** in Boroa (20 kilometers from Bilbao - Basque Country).
(https://www.gestamp.com/Personas/Universidad-Corporativa/Transferencia-de-conocimiento).

This Institute has the most advanced technology for the manufacture of automotive components and carries out two types of training using the "Learning by Doing" methodology as well as providing training online.

Training for workers of different factories within the Gestamp group. Each year, workers from the Gestamp factories around the world, come to this centre to receive training in the use of newest technologies such as:

- Robotics (various levels)
- Computer vision
- Die-cutting
- Etc.

To establish which courses will be provided and their content and duration, the factories' Human Resources directors analyse the training needs of their workers in each factory. Each factory's HR director then sends the training needs to the different managers of each division. In the case of the factory our Vocational Training Centre collaborates with, the proposed needs are sent to the Southern Europe Division. Once each division receive the proposals, they plan the courses considering the contents and languages (English and Spanish).

Each factory sends the workers they deem adequate. In the case of Gestamp Abrera, it is an agreement with the department directors and the plant manager. During the last few years, between 7 and 10 workers of Gestamp Abrera have gone to take courses at Gestamp Technology Institute.

The length of training time can vary from one day to one week, depending on the type of course, but usually it does not take over a week. Gestamp covers all the expenses of the training; it means the workers do not pay anything. The "Train of Trainer" is a very innovative method and it guarantees that the tutor and/or mentor of our students will have received high quality training.

Young Talent Programs are advanced training programs about technology that Gestamp Abrera develops in their factories, and combine the training from the centre located in Boroa with a paid internship taking more than six months at any of the Gestamp factories across the world. In order to be able to access to these training sessions, it is required to have a High-Level VET course in Technical studies or a University Degree in Engineering. The courses take two semesters: in the first one, the students have the training at the centre, and in the second, they do their internship in the factories. Some of the courses they are offering right now are:

- *Quality Engineer and Metrology Foundation Degree:* The program aims to develop the future reserve of metrologists at Gestamp.

- *Automotive Engineering CAD/CAM/CAE Skills Certificate:* the objective is to create a pool of professionals in design engineering and simulation in CAD-CAM and CAE engineering for Gestamp I+D centres.

- *Tool and Die Design, Production and Maintenance:* the objective is to create a pool of professionals for the design, maintenance and manufacture of dies.

For our "**STEP-UP Supporting Tutor's Educational and Professional Upgrade"** project, the first type of training, which developed for the workers of the different factories who will be our students' mentors and trainers, seems highly positive and innovative.

To learn more about this, we have contacted the two following contacts from Gestamp:

Cayetana Aranzadi

Position	Corporate Learning and Development at Gestamp (Madrid)
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Daniel Fernández

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Second Example: CELSA BARCELONA S.A.

Celsa Barcelona S.A. (Compañía Española de Laminados) is a foundry of CELSA GROUP Company, and focus his job on producing steel in different formats. It was founded in 1967 and is located near to Salesians Sant Vicenç dels Horts School (SVH). CELSA GROUP has presence in 11 countries and is one of the main manufacturers of steel in Europe.
(http://www.celsabarcelona.com/Home.mvc, https://www.celsagroup.com/en/)

For many years, Celsa Barcelona accepts SVH students from VET and Dual VET systems, especially from the Higher VET studies in Administration and Finance, and Robotics and Industrial Maintenance.

Celsa is currently immerse in an innovative process of training which vertebrate workers in three phases:

- 1st Stage. The Human Resource department, through comprehensive work, has established the basic skills for each workplace and the training and skills of each of its workers. Considering this information, a training plan was developed to achieve these skills. This plan includes different courses such as the use of virtual reality cameras to train workers who will use bridge cranes.

- 2nd Stage: Implementation of the training. GRUP CIEF, an external company, facilitates part of this training. *(https://www.grupcief.com/cief/es).* This company is specialized in training of workers in different Spanish cities. The contents of the training, as well as its timing, are designed by the Human Resources Department of Celsa Barcelona, together with Grup CIEF and with the Business School department of Salesians Sant Vicenç dels Horts. There is an agreement about the modules of the VET studies taught at Salesians Sant Vicenç dels Horts, the Celsa workers have the option of recognition of this training with part of the content of some VET studies. Depends of the type of training, it can be at Celsa Barcelona's own facilities or at Salesians Sant Vicenç dels Horts School.

- 3rd Stage. Recognition of the training given by GRUP CIEF to Celsa Barcelona workers. In this stage, the Salesians Sant Vicenc dels Horts School is responsible to check the training contents and to probe that are in line with the content of a specific module of VET courses. The Celsa workers will take a test and the ones who pass it will receive a certificate validated by SVH. It is an action to motivate workers and to support them to study a VET course.

  Celsa Barcelona cover the costs of the training, either with internal funds or with the reserved money from training credits, and the cost of the validation. The first branch of Celsa workers will end the training in September 2020, so we still don't have exactly numbers about the workers who will sit the test. Improving the skills of Celsa Barcelona workers is equivalent to improving the skills of our students' tutors

To learn more about this, we have contacted the two following contacts from GRUP CIEF and from Celsa Barcelona:

Ángel Carulla

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Alicia Rodríguez

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Third Example: AMES

In the case of AMES, which is one of the companies that we visited and that we mentioned in the previous sections of this document, we found the way they train their workers in technical areas very interesting.

AMES, using cutting-edge technology and being a company where they themselves design and manufacture the machines, and they themselves use in their sintered parts manufacturing process, have opted for self-training.

Only in the event that they need training in a technology that they have never used before, they send a worker to a technology centre to be trained, but in general they have chosen to carry out the training themselves.

This means that if there is a worker with knowledge in Computer Vision or in manufacturing with 3D printers, this worker trains their colleagues.

The company does not pay the training worker, but they try to make it that the training is always done within their working hours.

On the other hand, at AMES they always have staff from Universities doing their PhD within the company. The company provides facilities and laboratories for them to develop new prototypes and at the same time transfer their knowledge to other colleagues.

To learn more about this, we have contacted the following:

Anna Esteller Briñardeli

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4. Examples Italy

iCNOS project: using new technologies to support learning

This experimentation has been realized in the year 2012-2015, with a wide experimentation that took place in over 30 IVET centres all over Italy. The research had set itself the objective of verifying the congruence between the didactic tools (with particular reference to aids - books, software, etc.). - and mediators - e.g. Interactive Multimedia Blackboard or other) with the pedagogical paradigm of constructivist didactics and with the description of the learning goals of the European Qualifications Framework (and in general of the standards in force in the three-year courses).

Starting from 5 assumptions:

- Technological innovation has no value in itself but only takes on meaning if and when it becomes a vehicle and/or an opportunity for organisational and methodological-didactic innovation.
- Technological innovation cannot be implemented sporadically, but implies the "virtuous" interaction between all the actors interacting in a homogeneous context, continuity over time and the consolidation of good practices.
- The most significant innovations are those that manage to become the shared heritage of all the actors involved (teachers, students, managers, parents, referents...) and trigger processes aimed at improving the overall quality of the organization in which they are located.
- Any technological innovation implies a systemic "vision" and requires constant investment, permanent strategies to support the actors involved and flexible policies of literacy, continuous training and updating of skills.

The most significant methodological innovations that technologies can facilitate or support are those that bring students back to the centre of the learning process and encourage them to be "actively involved".

- The hypothesis, was that the extensive use of the tablet could facilitate the teaching by skills, modelled around certain characteristics:
- Transformation of the role of the teacher, from knowledge provider to educator, as well as facilitator of meaningful research and interaction processes;
- Research and active use of available resources (distributed knowledge) according to complex and interdisciplinary work mandates;
- Production of multimedia objects, which network knowledge from various disciplinary fields, linking them for communicative and constructive purposes;
- Evaluation understood as the estimation of real tasks.

The design intent therefore consisted of a profound change in the approach to the relationship between teaching and learning, shifting the centre of gravity from teacher to pupil, from speech to action, from listening to collaboration and negotiation.

	Model 1.0	Active Model
Knowledge	It is fixed	It is built
The source	The teacher, the book	The world, ourselves, others
Mode	Broadcast	Research, construction
Tool	The word (frontal lesson)	The action (research and mobilisation of internal and external resources)

Teacher training is an essential variable of the project: the role of the teacher, in fact, rather than being "halved" by the introduction of new media, becomes even more important and delicate. While the function

of knowledge transmission is so to speak simple (repetitive, standard), that of facilitating skills in view of the profitable use of new tools (minimizing the risks of superficial and reproductive use) is actually more complex and challenging, extending from the preparation of work mandates to help in the identification of resources, from the expert example in the use of applications to the evaluation of the final products.

Therefore, the first phase of the project was aimed at the training of project contacts, and, in a cascade, of trainers, through the Identification of the classes of some Vocational Training Centres students to experiment the introduction of the iPad in the teaching action; the provision of the iPad for early familiarization; training in the use of the tool and applications useful for educational purposes, to put the selected teachers in a position to deepen the use of tools and methodologies for the development of educational creativity.

To this end, from the technological point of view, the following methodological points have been addressed:

- Systems for sharing resources in groupware: list and possible paths, methods and case simulation;
- Design, creation, publication and distribution of eBooks in ePub and multi touch format, from handouts to textbooks, manuals and catalogues, with direct guided experiences;
- creation of lesson formats with iPad and audio-video creation and distribution tools, from Talk lesson to video documentary, passing through podcasting;
- Collaboration systems with Mac servers, Wiki, Google App; organization and management of collaborative systems through social tagging systems and the YouTube model.

From the pedagogical and didactic point of view, the general aims of the experimentation were shared, both in terms of pedagogical perspectives and minimum objectives, according to the opportunities and constraints of each single Vocational Training Centre involved, starting from the perception of how lesson formats, spaces, times and groups could change according to the increased class.

Training of dual tutors in Italy: an example of good practice. The QUALIT project

It is a project co-financed by the German Federal Ministry of Education and Research (BMBF) and conducted by the Italian-German Chamber of Commerce with a consortium of German partners. It's developed in cooperation with the German Office for International Cooperation in Vocational Education and Training (GOVET) as well as with the Italian National Agency for Active Labour Policies (ANPAL), its service society (ANPAL Servizi) and the Italian Ministry of Education, Universities and Research (MIUR)

The project provides:

a) Qualification and certification of dual tutors within companies and training institutions through delivery of basic workshops in almost all Italian regions;
b) Qualification and certification of Master Trainers by conducting advanced courses;
c) Sustainability and replicability of the model: Master Trainers will deliver basic workshops for potential dual tutors in their regions;
d) Creation of a standard qualification system for all tutors involved in the dual vocational training sector;

The implementation phases of the project include:

1) Selection of Company trainers and VET teachers in each Italian region;
2) «Basic-Workshops»: qualification and certification of dual tutors throughout Italy;
3) «Advanced course Masterclass» training path throughout Italy;
4) Creation of a network of multipliers throughout Italy;
5) Development of a financial and organisational sustainable model;
6) Final goal: creating a system for the standard qualification of dual tutors.

And all this to achieve the following goals:

i. Create a standardised qualification system and a single language for all professionals working in the dual VET sector in Italy
ii. Ensure the sustainability of the system through the development of an organizational and financing model
iii. Launch a systemic action that continues beyond the end of the project in 2020

The Basic Workshop «Qualification of dual tutors» consists of:

- 4 modules in 4 days
- Interactive teaching modality
- Around 12 participants (company trainers & VET teachers)
- Final exam: written and practical/oral test

Issuing of final qualification as a «dual tutor» according to the German model

5. Examples Lithuania

"VET4.0" for VET teachers and trainers for mechatronics and electronics.

Website: www.vet-4-0.eu

This training course is open-source and free-access to all teachers and trainers.

The prepared training modules are mainly focused on the concrete competence needs at the training places. Therefore, they are most suitable for the trainer and mentor training at the institutional level.

The modules are structured according to the logics of competence development of teachers and trainers in electronics and electronics needed to provide the competences relevant for Industry 4.0. The modules are structured on the basis of developed competence matrix of "digital" competencies of VET teachers:

Competence Matrix Teachers Vet 4.0				
	Digital Key Competences			
Core Working Fields for Teaching	**1. Professional Competences 4.0**	**2. Media competences**	**3. Application Know-how**	**4. Basic ICT Know-how and Skills**
A. To develop and implement annual teaching plan and to manage documents	1.1. To identify technological and organizational changes in the mechatronics and electronics in the systemic way for the training course and to prepare them didactically. 1.2. To evaluate the possibilities and risks of the digitalized work and business processes. 1.3. To restructure networked process chains in learning. 1.4. To train by applying content of embedded systems, including their operating systems. 1.5. To provide know-how on handling interactions with sensors, reading information and collecting of data. 1.6. To train on handling the processes of robotics (robot and "cobot"), including know-how to program and control production robots in the different technological processes. 1.7. To provide know how on the installation and exploitation of the Internet of Things and CPS.	2.1 To identify and assess digital key competences applied in the ICT media. 2.2 To identify the media competences applied in the work, business and social contexts. 2.3 To design and plan the installation of the media technologies in the school. 2.4 To organize cooperation of learners in the digital learning environment. 2.5 To organize knowledge management.	3.1. To install learning management systems. 3.2. To install specialized social media 3.3. To install professional software for learning. 3.4. To select and install the didactic instruments for cooperative learning. 3.5. To document the digital teaching plans for common (cooperative) usage. 3.6. To handle software for management.	4.1 To install professionally office software appliances. 4.2 To configure and set-up learning management systems. 4.3 To provide digital applications in the local area network.
B. To plan and design learning processes	1.1. To design the concept of digital process chain (4.0) in the teaching and learning process. 1.2. To select digitalized learning and teaching scenarios that facilitate problem oriented and self-organized learning. 1.3. To plan and execute interactive, virtual and individual learning phases. 1.4. To select interactive media for learning and training.	2.1. To select, install and evaluate the digital teaching and learning scenarios. 2.2. To check the used media for accessibility/openness, problem solving and requirement level. 2.3. To check on how the media facilitate development of decision making skills, abilities to cooperate and creativity.	3.1 To install the elements of digital learning scenarios and formats (Blended und Online-Learning).	4.1. To integrate audio and video data 4.2. To prepare video-tutorials 4.3. To prepare digitalized content. 4.4. To integrate the data from external and internal sources in the teaching. 4.5. To consider copyright protection issues.
C. To communicate, cooperate	1.1. To organize the interdisciplinary cooperation in the learning process. 1.2. To present the information and data for learners by using interactive media. 1.3. To communicate, collaborate and coordinate the learning process with external partners. 1.4. To ensure the safety of personal and corporate data used in the training and work processes.	2.1. To execute timely and operative communication with the internal (school) and external addressees regardless their location and time.	3.1. To apply the digital communication instruments for the regular and remote teaching. 3.2. To use electronic teaching diaries.	4.1. To handle inquiries and feedback from the digitalized instruments.
D. To analyze and evaluate learning process, achievements and success of learners	1.1. To check media usage for occupational and learning relevance. 1.2. To design cooperative online reflection processes. 1.3 To evaluate content, human and technical resources for media use.	2.1. To identify informally and non-formally acquired digital skills. 2.2. To analyze students' media literacy development. 2.3. To analyze and classify media technology in the course of education.	3.1. To plan and evaluate the formats of individual and team activities. 3.2. To select and install the online tools for diagnostics and assessment of performance at learning and work.	4.1. To collect, aggregate, analyze and evaluate data from learning processes (Learning Analytics). 4.2. To adjust the performance rating tools. 4.3. To apply privacy and data security requirements.

Source: www.vet-4-0.eu/teachers-matrix.html

The structure and contents of the modules themselves is based on the execution of the training projects with students.

The modules for teachers and trainers in vocational education and training (VET) give an introduction into working world 4.0 with a focus on the fields of mechatronics, electronics and IT. The basic idea is to orientate the acquisition of competences along process chains as it is necessary in a networked and digitalized production.

Like the students, the teachers or trainers are forced to individual learning and to combine self-learning with learning in a group. The modules are closely related to the modules for students. Teachers and trainers have to partly retrace by themselves the learning processes which they expect from their students and thus recognize difficulties and challenges. This enables them to adapt and further develop the existing modules with close regard to their own learning group.

The modules offer important background information, e.g. competence matrices 4.0 for teachers and students, supporting forms as well as didactical notes, sample solutions and useful links. A short overview on the particular modules you will find under "basic questions".

Objectives

- Teacher or trainer is able to implement the students' learning module with his/her own students.
- Teacher or trainer is able to consider the gained insights for future learning and teaching with digital media.
- Teacher or trainer is able to analyse the module with regard to learning and teaching. He/she can appraise to which extent the example is suitable for his/her students and where adjustments are necessary.
- Teacher or trainer is able to practically implement the module and to arrange own 4.0 learning settings.
  He/she is able to recognize the expected learning achievements.
- Teacher or trainer is able to use the module in order to increasingly implement digital elements in the class.
- Teacher or trainer is able to appraise how further digital learning modules can be implemented in his/her school.
- Teacher or trainer is able to further develop the existing module respectively to develop new modules in this field.

6. Learning Modules for Teachers and Trainers

This module gives an introduction to basic aspects of a digitalized world with fully automated production. It also broaches the issue of possible societal consequences.

You will find more information here.

A networked and automated system has been developed at the example of plant irrigation. It also can be controlled by an application which is useful e.g. if you are in holidays. Teachers learn how to implement this by cheap devices and how to organize the learning process of their students.

You will find more information here.

An Intelligent House 4.0 comprises several fields. The issue of this module is to install and integrate smart light control into existing smart home systems. It can easily be adapted to other fields, e.g. smart security control.

You will find more information here.

Rapid product development offers a broad range of applications. A product chain with networked components produces a trolley chip. The devices have been designed and assembled by using a 3D printer. The whole process is explained and can be varied and adapted in this module.

You will find more information here.

Digital Factory for Individualized Mass Products

The production of a customer-oriented mass product includes, from the point of view of production, several areas. The present learning module is subdivided in five section, which is intended to represent the closed process chain of a parameterized product. The product, as a learning support, must be designed customer-oriented as a 3D model. Here, the focus is on the individualization of the product. From this, all further production-related data can be derived (rapid prototyping, CNC and CAM programs), which can be used to manufacture the product. Thus, another focus is on the level of data processing.

The concept and various examples can be used as a basis for planning.

You will find more information here.

"TTT4WBL - Testing New Approaches for Work Based Learning"

Implementation period: 2017-2020 Website: https://ttt4wbl-project.eu/ (temporaly unavailable)

The participants of the courses were selected by inviting the trainers from the companies and candidates for trainers from the all regions of the 3 Baltic states: Lithuania, Latvia and Estonia. There were developed training modules for trainers and VET teachers. The training was organized on the regional and institutional level by involving VET teachers and trainers and applying so called 'tandem model' of training, when the know-how is exchanged between the VET teachers and trainers, thus helping trainers to acquire pedagogical knowledge and skills and VET teachers to acquire technological know-how and skills.

The contents of curriculum in Lithuania is focused on the implementation of apprenticeship as alternative form of vocational education and training, thus it follows the requirements of the national VET policy. The topics are focused on the identification of the needs and benefits of apprenticeship, understanding of the national system of qualifications and the LTQF in relation to implementation of apprenticeship, steps of implementation of apprenticeship, methods of teaching and communication in the apprenticeship schemes, assessment of competencies of apprentices. The main challenge in organizing the tutors training in Lithuania was a passiveness of employers. Despite of the recent efforts of the Government to promote apprenticeship as the main future trend of vocational education and training and introduction of the new VET legislation at the end of 2017, the readiness of employers to engage in the implementation of dual apprenticeship remains quite fragmented and un-systemic. Only few sectors and sectoral organisations of employers (construction, engineering) demonstrate more active and proactive approach to the implementation and development of work-based learning and apprenticeship. The relationships between the VET centres and companies in organizing WBL remain highly fragmented and weak, cooperation in this field is too formal. Top-down neoliberal initiatives of the Government to promote dual apprenticeship so far are not accompanied with the critical mass of bottom-up initiatives by the companies and VET centres. In this context the project creates a good opportunity to trigger and stimulate such bottom-up initiatives. The curriculum for training of the WBL tutors and trainers is strongly oriented to the macro-level issues of apprenticeship implementation, such as legislation, NQF etc. It fits to the current context and helps to fill the gap of know-how on these issues amongst the business community and VET providers. However, there remains a question to what extent this know-how can help to initiate bottom-up activities in the field of WBL and how to ensure the quick and smooth application of provided know-how in the local practices of VET centres and enterprises.

The contents of curriculum in Estonia is focused on the processes of work-based learning and training. Curriculum contains the following topics: setting a purpose for the practical training; identifying mutual expectations; preparing supervisor's plan of action; partial profession; supervisor's role and competences, skills; roles and responsibilities of the practice supervisor; supervisor's self-reflection; supervising, including examining the trainee's motivation (also in the process of motivation decrease); communication competences, self-expression; evaluating the effectiveness of the training; collecting and analysing feedback at different stages of the training process.

In Latvia curriculum for training or trainers is focused on the following sets of skills:

- planning and organization of WBL process, coordination;

- communication and cooperation;

- guidance (pedagogical aspects).

Curriculum is focused on the provision of basic conceptual know-how needed for development of work-based learning. Curriculum provides clear and explicit reference to the existing situation of the work based learning in the country, a lot of attention is paid to the establishment of mutual understanding of the roles and responsibilities of different stakeholders involved in work-based learning (especially enterprises and training centres). The structure of curriculum follows the logics of the structure of work-based training process and involves the stages of planning and preparation of the WBL and traineeship, implementation of these training processes, assessment of trainees and evaluation of the WBL activities. The topics of curricula are comprehensive and multidisciplinary and provides learning outcomes related to institutional regulation, organization of training, psychology of learning and didactics and other fields. Curricula are developed on the rich basis of the results of the other international projects in the field of work-based learning.

The TTT4WBL tandem trainings were organised in three phases – the last round of field trials was implemented from August 2018 till January 2019. Altogether 50 tandem trainings were organized during the three phases. The total number of trained WBL tutors is 820 (Latvia – 300, Lithuania – 312, and Estonia – 208) involving around 80 VET schools and 250 companies across most regions of the three Baltic countries. During the field trials, quantitative and qualitative research data was collected through surveys and group interviews to study the impact of tandem training on tutor competences and the quality of WBL. Based on participants' feedback and researchers' proposals the tandem training programme was reviewed and improved after each round of national trainings.

Empowering Metalworkers For Smart Factories Of The Future (4CHANGE)"

Implementation period: 2016-2020 Website: http://change4industry.eu/en/

The overall goal of the project is to tackle skills gaps of metalworkers by addressing the following objectives: to design and deliver a new targeted VET programme based on the current and future skills demand in the metalworking sector, and to develop a self-adaptive work-based learning system in combination with coaching. This project tackles the problem of increasing mismatch between the new skills needs caused by the use of Computer Numerically Controlled (CNC) machines in the industry and the content of teaching in VET institutions. This mismatch is exacerbated with the trends of digitalization and application of the 4th Industrial Revolution technologies in the metalworking.

There are two main objectives of the project:

- To design and deliver a new targeted VET programme based on the current and future skills demand in the metalworking sector.
- To develop a self-adaptive work-based learning system in combination with coaching for motivation and innovation.

Orientation to the issues and problems of work-based learning in this project is ensured by several factors:

1. Focus of the developed training curricula and materials on the changing competence requirements emerging from the technological and organisational elements of 4IR in the work of CNC operator. There was conducted survey of the representatives of metalworking companies in the Baltic countries and Germany and on the basis of findings developed profile of qualification of CNC operator integrating qualifications references to EQF levels 3, 4 and 5 (http://change4industry.eu/en/pages/about-professions.html). The model of qualification represents 5 core skills of A1 Basic and Advanced Technical Skills, A2 Digital Skills, A3 Smart Factories, A4 Change and Innovation, A5 Self Learning and Coaching. These core skills include 13 areas of specialisation.
2. On the basis of developed qualification profile there were prepared apprenticeship training plans providing more detailed specifications of identified competencies and suggestions on the share of theoretical and practical training (http://change4industry.eu/en/pages/information.html)
3. To help the apprentices and learners there is provided a textbook for learning theory and workbook with the practical tasks and guidelines. Workbook content is related with the Textbook and includes exercises based on industrial practice and sample solutions. Trainees in a Workbook will find exercises related to a particular subject practice problem. It includes exercises which are designed to provide practical training in dealing with cases encountered in modern factories. (http://change4industry.eu/uploads/Docs/doc1628/1582650658_workbook-en-9.pdf). There is also provided trainer's manual with the detailed information on the different training and learning tools and references for training in the modules (http://change4industry.eu/uploads/Docs/doc1630/1582667086_trainer-manual-en-2020.pdf).

For the individualised work-based learning there is prepared e-learning platform enabling learning of developed modules at the workplace and beyond it (https://cnc4change.org/?redirect=0&lang=en).

6. Categorisation of cases

Example	online?	Target group	funding	multi-language?	open acess?	assessment?
DE 1: mobile-tech	y	VET-trainers	E+	y	y	no
DE 2: opendigi	y	Skilled workers	ESF/national funds	no	y	y
ES 1: GESTAMP	no	Skilled workers	private	y	no	no
ES2: CELSA	no	Skilled workers	private	no	no	y
ES 3: AMES	no	Skilled workers	private	no	no	no
IT 1: iCNOS	no	VET-trainers and teachers	National funds	no	no	Self-assesment
IT 2: QUALIT	no	VET-trainers and tutors	BMBF	no	y	y
LT 1: VET4.0	y	VET students, teachers and trainers	E+	y	y	y
LT 2: TTT4VET	no	VET trainers	E+	y	y	y
DE 3: metals	y	skilled workers and apprentices	E+	y	y	y
LT3: CHANGE4Industry	y	VET students, teachers and trainers	E+	y	y	y

Example	who trains?/developed the content?	dida. Approach	content	length
DE 1: mobile-tech	VET-teachers	Self-regulated	generic for online learning	30 hours
DE 2:opendigi	University staff	Self-regulated	I 4.0	~30 hours
ES 1: GESTAMP	Company + Technology Institute	Self-regulated	I 4.0	8-40 hours
ES2: CELSA	Company + VET-school	WBL	I 4.0	33 hours or Multiple of 33 hours
ES 3: AMES	Company	WBL / Traditional	I 4.0	varying, but normally less than 15 hours
IT 1:iCNOS	University staff + Company (Apple) + VET-teachers	constructivist	generic for iVET WBL	32 hours
IT 2: QUALIT	Certified VET trainers, content developed by AHK and german and italian partners of the project	online	WBL	30 hours (20 virtual sessions, 10 self-learning)
LT 1:VET4.0	Provided content and guidelines for VET teachers, trainers and students in the specific modules/training projects	Self-regulated	Training of competences relevent to Industry 4.0 changes in mechatronics and electronics	varying from 20 to 80 hours
LT 2: TTT4VET	Training materials for work-based learning trainers (organisation of training, legal regulations, didactics...)	traditional	Implementation and organization of WBL in the school-based environment	2020-08-30 hours
DE 3: metals	universties and VET-providers	Self-regulated	AM	27 hours
LT3: CHANGE4Industry	Content for training of CNC operators	Self-regulated, WBL	Online learning materials and guidelines for training of "augmented" CNC operators dealing with 4IR processes	varying