

## WELDONE CURRICULUM FOR WELDING TEACHERS AND TRAINERS

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### Abstract:

WELDONE Training of Trainers (ToT) curriculum replies to the need to capacitate teachers / trainers from EWF Qualification System, namely from welding and related technologies, and educators from Science, Technology, Engineering and Mathematics (STEM) fields, to acquire new competences for conducting theoretical and practical training using the WELDONE method. This method uses alternative pedagogical approaches (which can later be used by those teachers / trainers in their classes) with the aim of incorporating and developing key competencies into the learning outcomes of technical subjects. The development of the competences of teaching staff and educational leaders is based on the priority of changing the current approach towards the educational process in order to harmonize it with the needs and requirements of the labour market, adapting its implementation in line with recent developments in learning and teaching.

Thus, WELDONE methodology and pedagogical approach are based on a paradigm shift in learning and teaching that fosters students' active role in their own learning process, where they conduct research and interact with other actors of the teaching process, acquiring new knowledge and developing new skills.

WELDONE ToT curriculum aims to promote an updated approach to teaching within EWF Qualification System and STEM fields through the incorporation of innovative pedagogical approaches into teaching processes for the development of key competences.

It is being developed within the European Erasmus + project "WELDONE - Boosting innovation in welding training", the components of which will be presented in this paper.

## 1 INTRODUCTION

For many years, there has been a shortage of skilled workers in the world economy. Welder is one of the occupations where this is particularly pronounced. Many analysis have shown that one of the main causes of such situation is the negative perception of young people about certain jobs and outdated education systems. Moreover, it is obvious that those responsible for education and those who educate have not recognized, (or are unprepared for) the rapid development of technology, the strength of these changes and their impact on societal trends - especially of young people. This is particularly felt in Vocational Education and Training (VET).

No in-depth analysis are required to conclude that traditional learning methods need to change according to the behaviour and consumerism of the younger generations. Therefore, students, their needs and their way of learning should be placed at the centre of new pedagogical guidelines and methodologies. In other words, different strategies need to be found and implemented. Research conducted by Christy Price (EdD, and psychology professor at Dalton State College), resulted in Five Strategies to Engage Today's Students [1]. Strategy 1 - Research-based methods. Research suggests that the younger generation prefers a variety of active learning methods. If the information does not attract their attention, they move on. The ideal learning environment is: less lecture, use of multimedia and collaborating with peers. Strategy 2 - Relevance. Young people do not value information for the sake of information. As a result, the role of the teacher is changing. It no longer disseminates information but helps students to apply it. Perhaps the biggest challenge for teachers is how to relate the content of the subject to current practice and how to make learning outcomes and activities relevant. Strategy 3 - Rationale. Young people are socialized in a non-authoritarian way and are therefore more likely to abide by the rules when teachers explain their tasks to them. Strategy 4 - Relaxed. The younger generations prefer a less formal learning environment in which they can communicate informally with the teacher and with each other. Strategy 5 - Rapport. They are willing to follow learning outcomes when teachers and trainers connect with them on a personal level.

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In order to initiate the necessary changes, an Erasmus + funded project called “Boosting innovation in welding training” or WELDONE, was launched in 2019.

The main objectives of the WELDONE project are to:

- Promote an uptake of an active learning approach by the EWF Qualification System and technical training in general,
- Promote the use of alternative pedagogical approaches by technical trainers and teachers (e.g. use of digital resources, problem-based learning and other innovative approaches),
- Challenge educators from the STEM field to embed in their own educational resources the development of key competences in trainees,
- Foster an entrepreneurial spirit in European citizens able to research, select, analyse, organize and present information,
- Improve the provision of higher VET, increasing the attractiveness and relevance of VET.

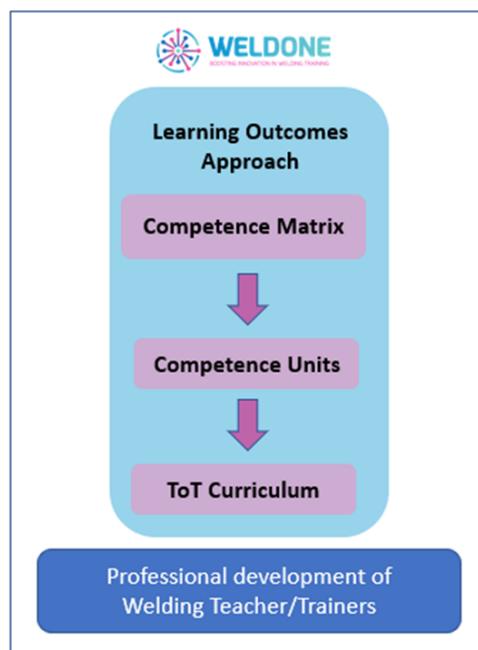
The main result of the project is the WELDONE Training of Trainers (ToT) curriculum for the acquisition of new competencies for conducting theoretical and practical training using the WELDONE method. This method is characterized by alternative pedagogical approaches in the teaching process based on the inclusion and development of key competences in the learning outcomes of vocational subjects, adapted to the needs and requirements of the labour market.

The WELDONE ToT curriculum has seven Competence Units (CUs), organized in Learning Outcomes (LOs) written in terms of skills and knowledge to be acquired by trainees (i.e. teachers / trainers /educators) at the end of the learning process, structured in a modular approach.

Encouraging an active learning environment, with experiential learning and project work methods, where the school environment can encourage creativity and risk-taking, as well as accept mistakes as a valuable learning opportunity, teachers and trainers from the EWF Qualification System, as well as educators from STEM sectors will be able to incorporate the development of key competences into their own educational resources, following the recommendations of the Council of the European Commission.

This curriculum also paves the way for teachers / trainers to be flexible in developing pedagogical strategies and to be adaptable to different content, making the most of today’s digital tools and environments to bring students closer to real life situations, making learning a meaningful process for them, now and in the future EWF and its Qualification System are the main focus of WELDONE project, as all its results will implemented in Approved Training Bodies (ATBs) belonging to EWF network. In addition, WELDONE results will also be available for STEM Educators as a way to broaden its impact beyond the Manufacturing sector.

The scheme in Figure 1 shows the structure of the ToT curriculum, which shows that it is based on learning outcomes, ie it is in line with current European approaches to education and training. The ToT curriculum encourages teachers / trainers / educators to direct their activities in that direction.



*Figura 1. WELDONE ToT and the professional development of Welding Teachers/Trainers*

## 2 TOT CURRICULUM

### 2.1 Implementation | Workshop Model

The WELDONE workshop model is a framework that supports teachers and trainers in motivating their students to take responsibility for their own learning process, become active and involved in their work, and develop skills, competences and understanding. Used to implement the ToT curriculum, it is a general guideline that describes the main components of an effective workshop. The model is actually a teaching model for WELDONE Competence Units (CUs) with the idea of reducing teaching and increasing learning. It is written for trainers who apply the ToT curriculum with their target participants (i.e. teachers and trainers from the EWF qualifications system and STEM educators), who will then be able to apply what they have learned with their students.

The model framework has been developed in a way that also takes into account the descriptors of the European Qualifications Framework (EQF). It describes a four-step method that is easy to follow and can be used in different Education and Training systems.

The model helps to organize and schedule the teaching of basic skills and knowledge on which the ToT curriculum CUs focus. Teachers and trainers are encouraged to adapt and implement CUs' contents in smaller units, suitable for focused sessions. Predefined LOs are starting points on which each session can be upgraded.

This workshop model consists of several sessions. Each session consists of four elements: Opening (I), Mini Lesson (II), Working Time (III), and Debriefing (IV). It is supplemented by additional topics such as preparations and useful tips.

The workshop model can be used for scientific, technological, engineering and mathematical competences, digital competences, personal, social and learning competences, entrepreneurial competences - key competences addressed by the WELDONE ToT and pedagogical approach.

### 2.2 Competence Matrices

The competence matrices that are part of the WELDONE ToT curriculum are the basis for structuring its CUs, organized in terms of LOs, i.e. a set of knowledge and skills that will be acquired by trainees - welding teachers and trainers and STEM educators. The LOs of each Competence Matrix are written in accordance with a certain level of the European Qualifications Framework (EQF), level 4 or 5, depending on its scope. The scope was derived from the expected prior knowledge and skills that participants have on the topics covered for each individual Competence Matrix / CU. Prior knowledge and skills vary from country to country within the EU and are linked to the professional profile of teachers / trainers in those countries.

Table 1 Table 1 EQF level 4 and 5 | Learning Outcomes' description

EQF Level	Knowledge	Skills	Responsibility and Autonomy
The learning outcomes relevant to Level 4 are:	Factual and theoretical knowledge in broad contexts within a field of work or study	A range of cognitive and practical skills required to generate solutions to specific problems in a field of work or study	Exercise self-management within the guidelines of work or study contexts that are usually predictable, but are subject to change; supervise the routine work of others, taking some responsibility for the evaluation and improvement of work or study activities
The learning outcomes relevant to Level 5 are:	Comprehensive, specialised, factual and theoretical knowledge within a field of work or study and an awareness of the boundaries of that knowledge	A comprehensive range of cognitive and practical skills required to develop creative solutions to abstract problems	Exercise management and supervision in contexts of work or study activities where there is unpredictable change; review and develop performance of self and others

(Source: Descriptors defining levels in the European Qualifications Framework (EQF) (EC, 2019), in <https://ec.europa.eu/ploteus/pt/node/1440>)

The project defines the target groups and requirements for attending the WELDONE ToT course:



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- Teachers / trainers belonging to the EWF qualification system, educators from the STEM field and from vocational and / or adult education, interested in including the WELDONE approach in their training / teaching practice;
- Good level of understanding of English (necessary to understand all supporting documents).

Most WELDONE competence matrices /CUs are designed in accordance with level 4 of the EQF. However, there are also competence matrices /CUs written in line with level 5. The level of EQF to which the competence matrices /CUs refer is not an input requirement for the group goal; it reflects the level of expertise expected at the end of the WELDONE Training of Trainers.

According to CEDEFOP (2017) <sup>1</sup>, “Learning Outcomes are designed using a horizontal axis that identifies learning domains (e.g., knowledge and skills) and a vertical dimension that indicates learning complexity, which increases from level to level”.

The Competence Units developed within the WELDONE ToT curriculum take this approach into account, defining not only Learning Outcomes in terms of knowledge and skills, but also pointing out specific subject titles (CU contents) and CU workload.

Each competence matrix /CU contains the following pre-defined elements:

- Course title - General contents of the curriculum;
- Learning outcomes - Organized / structured in terms of knowledge and skills;
- Contact hours - The total number of hours in which participants are involved in theoretical and practical training in the context of the classroom;

- Workload - An estimate amount of time that students typically need to achieve defined learning outcomes. It includes theoretical training and independent learning, as well as time dedicated to practical classes and exams.

The ToT curriculum consists of the following Competence Units (with the specified EQF level):

CU1 – Multiple Intelligences and Learning Styles – EQF 4

CU2 – Learner Centred Didactics: Problem Based Learning, Critical thinking and Collaborative Learning – EQF5

CU3 – Gamification - EQF 5

CU4 – Digital competence and using digital resources - EQF 4

CU5 – New media didactics: the use of social media and micro-learning - EQF 5

CU6 – Personal, social and learning competences - EQF 4

CU7 – Entrepreneurship competence - EQF 4

The following figure demonstrates a competence matrix template, used by WELDONE Partners to design the ToT CUs:

Competence Matrix   Name of the CU	
SUBJECT TITLE (S)	
...	
...	
...	
<b>CONTACT HOURS (Total)</b>	
...	
<b>WORKLOAD</b>	
...	
LEARNING OUTCOMES (name of the CU)	
KNOWLEDGE	(Descriptor of the EQF level addressed by the CU/Qualification)
	<ul style="list-style-type: none"> <li>• (...)</li> <li>• (...)</li> </ul>
SKILLS	
	<ul style="list-style-type: none"> <li>• (...)</li> <li>• (...)</li> </ul>

Figure 1 Competence Matrix Template

### 2.3 Competence Units| Contents

This section focuses on each Competence Unit (CU) addressed by the ToT Curriculum, developed in line with the respective Competence Matrices elaborated by WELDONE Partners addressed in the previous section.

Therefore, each CU focuses specific subject matters and Learning Outcomes, also answering to the following questions for contextualization (Context):

- **What is this Competence Unit about?**  
Explanation about the matters addressed by the CUs
- **Why is it important?**  
Includes impact of the CU towards trainees’ skills and competences and how they can include what they learn in their own work with learners
- **Relation with key competences’ development and/or other Competence Units?**  
Connection between the CUs and the key competences they address, in line with WELDONE purposes. In case there is a connection between other CU of the ToT Curriculum, that information is also provided, including how they connect.

This section also provides information about the pedagogical approaches and assessment tools developed and recommended by WELDONE to be implemented with the CUs during the Workshop sessions, as well as their purposes and application, focusing on:

- Number and duration of the Workshop sessions,
- Topics addressed in each session,
- Pedagogical approach,
- Human and/or materials resources needed,
- Exercises to carry out during the session(s), including description of their purposes and operationalization,
- Assessment tools to implement in order to assess trainees’ achievement of the Learning Outcomes established to that specific CU.

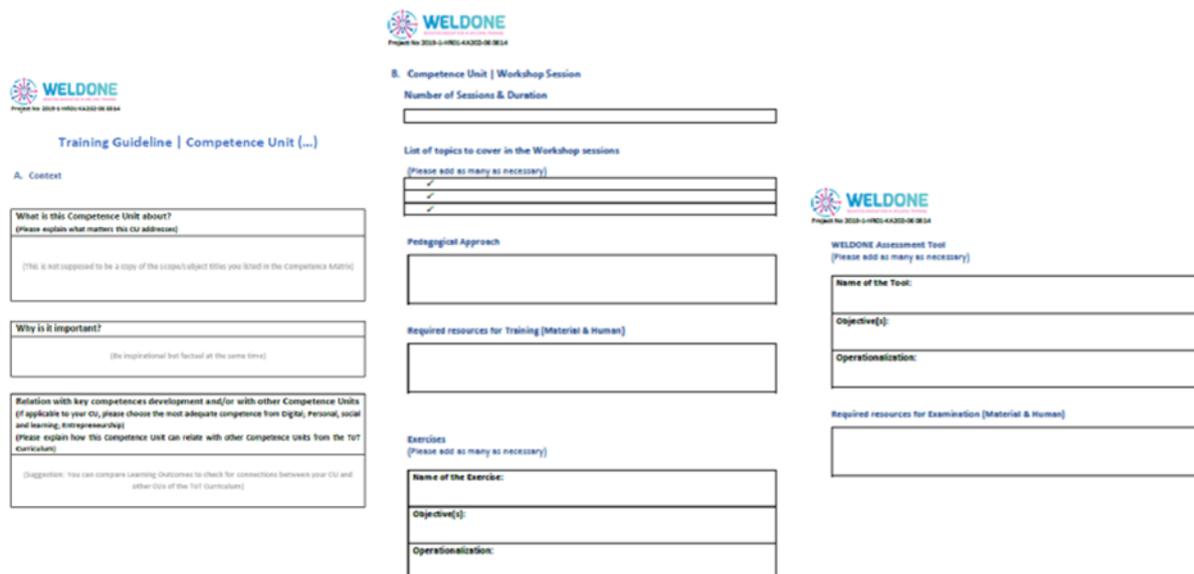


Figure 3. Training Guideline | Competence Unit template

### 3 CONCLUSION

A deep commitment to the principles that permeate the WELDONE ToT curriculum for teachers / trainers / educators has led to the creation of a new learning environment with specific topics that focus on students, their daily habits and their needs.

Curriculum for a train of trainers (ToT) course enables trainers and teachers to deliver technical training in a WELDONE way - using alternative pedagogical approaches and embedding key competences development in technical subjects' trainings.

The WELDONE methodology and pedagogical approach put emphasis on the active role of students in their own learning process, through which they conduct research and communicate with other participants of the teaching process, acquire new knowledge and develop new skills. The role of the teacher / trainer in such an environment changes, of course. Alternative pedagogical approaches open up space where they (teachers / trainers) no longer simply disseminate information but help students apply it, develop fluency in teaching and learning with technology, rather than use the same technologies. Linking the content of the course with current practices and how to make Learning Outcomes and activities relevant is one of the biggest challenges for teachers / trainers of welding and educators in the STEM field.

This curriculum also paves the way for teachers / trainers to be flexible in developing pedagogical strategies and to be adaptable to different content, making the most of today's digital tools and environments to bring students closer to real life situations, making learning a meaningful process for today's and tomorrow's students.

The concept of the WELDONE ToT curriculum has all the predispositions for a quality and reliable way to update access to teaching within the EWF qualification system and STEM area by including innovative pedagogical approaches in teaching processes for the development of key competencies. In this way he becomes an integral part of the International System for Training, Qualification and Certification of welding personnel and companies that deal with welding with the same possibilities for the STEM area.

This will greatly popularize vocational occupations, which are already high in demand in the world economy.

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