

**iQVet**

**D4.2**



**TEACHERS PROFESSIONAL  
CAPACITY BUILDING PROGRAM**

**Meldal VET School**



## Meldal VET School

Terje Grandetrø holds vocational certificates in welding and sheet metal work. He has two years of higher VET education in welding technology, combined with practical pedagogical education. He has worked as a VET teacher for 24 years, where he has engaged regional businesses through visits, student placements and internships. The school has co-operation agreements with most of the regional companies. They accept to take in students for placements during the school year. The school will send students to companies when they have a lot of production and need extra labour.

This collaboration makes it easier for companies to hire apprentices, as they may test out the students during the placements. The students gain more insight into the subject they want to work with and how the company suits them. The students can work in various companies and test out different professions. Finding CNC operators is difficult. One company is looking for such labour far beyond Norway's borders. The company wants to employ apprentices, so that they can train the students according to their production.

Terje has had the opportunity to try out the CNC specialism on his own and found it very interesting. He therefore worked actively to ensure that the school purchased a CNC moulding machine so that the VET school could serve this trade. He has had several periods of work experience in companies to learn as much as possible.

During training at the school with our students, I understood that the way we taught was not optimal. That's why the school joined an Erasmus+ project to develop new and more effective ways of teaching this subject by applying flipped work-based learning.

## Results

## THE VET PROVIDER Meldal VET

The VET school has tested out and had success with application of flipped learning methodologies in their work-based training activities. This is an educational approach that reverses the traditional teaching model by delivering instructional content outside of the classroom (typically by use of online video) and focusing on active, collaborative work-based learning activities during work-based class time in the work-shop.

Flipped learning helps securing active engagement during class activities where the time in the workshop is dedicated to discussions, problem-solving, and hands-on activities, allowing students to engage more deeply with the material. It helps shifting the focus from passive listening to active participation, enhancing understanding and retention.

The personalization of the learning pace let students review demonstration content, such as videos demonstrating the various production steps, at their own pace, pausing or replaying as needed. Such flexibility better supports students diverse learning styles and helps students better prepare for work-based training activities in the workshop.

This methodology let the VET school better focus the limited time available for work-based training on expensive special machines. This includes clarifying complex concepts, foster collaborative learning and secure the important HES issues.



# OUR CHALLENGES

During the everyday teaching operations with one teacher in each class during the work-based practices in the workshop, there is little time for extra training of students on the various machines. It is also very important to avoid accidents through dedicated Health, Environment and Safety (HES) issued training. These machines include six lathes, two manual milling machines, a band saw and two pillar drilling machines.

This has resulted in students having to wait to receive help from a teacher when conducting safety training on the various machines. The machine safety training is one of the most important things we provide to ensure that the training activities are as safe and secure as possible, both for students and staff. Therefore, the training of how to use the machines is carried out with a maximum of 2-4 students at a time, to ensure that the safety message reaches each individual student. If you have too many students at the same time, you don't get eye contact with each one and it is uncertain how much each student actually learns and understand the instructions.

The curriculum in the relevant program areas contains many competence goals and the students must be trained in many machines and equipment related to these. That's why it's so important that all students receive the correct training. Together with local businesses, the school acquired a CNC milling machine to cover the competence goals in the training. Local businesses are struggling to find new employees with expertise in the CNC field. It is therefore a goal and desire that more students want to study this subject.

In order to deliver the appropriate safety training on these machines, in addition to all the other types of equipment, we had to start thinking of a way to help us teachers in terms of reducing time spend on operating the machine with each group, and figure out a solution that could be handled with the resources offered by the existing staff group.

The VET school has recently become even more popular and attractive, whereby **the number of mechanical industry program students indeed have doubled during the last two years, while the number of staff and the available equipment haven't changed at all.**

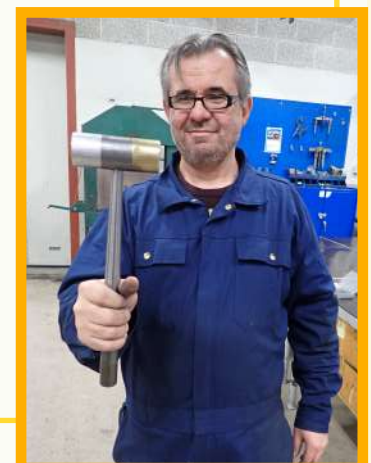


## OUR EDUCATION QUALITY

In order to handle the sharp rise in the number of students, the VET school must provide higher effectiveness in a VET system that should deliver specialized knowledge, skills and competencies. They must empower learners to succeed in handling all the learning outcomes, while applicable to real-production related challenges. The teachers use evidence-based pedagogical methods and adapt those to diverse learner needs, including the relevance, equity, and efficiency of the VET education, as well as the satisfaction of learners and stakeholders.

Due to the first success, the flipped learning program has been extended to include 11 additional videos of production of a copper/nylon hammer at lathes. These videos are addressing the following steps in the production of the hammer:

1. Adjust the length of the workpiece
2. Turn the screws on the center piece
3. Thread the screws on the center piece
4. Drill the hole on the center piece
5. Turning the copper and nylon head
6. Final finish on the head
7. Adjust length and drill center hole
8. Serrate the handle
9. Mark the length of the taper
10. Turning the screw and cone
11. Drilling holes in the handle and turning the bevel



# OUR SOLUTIONS

We started the activities in the project by producing six videos demonstrating the usage of the CNC milling machine, to be applied in a flipped learning methodology linked to the work-based training in the workshop. These videos were addressing the following basic training steps, and students may access them by applying QR codes:

1. Starting up the machine
2. Measurement of tools
3. Clamping the workpiece
4. Setting the 0-point on the workpiece
5. Finding the saved program and commissioning
6. Turning off the machine

Each student watched all the videos at home before attending the work-based practice in the workshop. There were from 2-4 students at each demonstration event at the machine during the work-based training. When students arrived to their practice session the teacher for each single group of 2-4 students, physically go through the entire start-up sequence, implementation and conclusion on the CNC machine.

The evaluations demonstrate that the students become much more “connected” and ask more questions during the run-through demonstration process compared to the traditional training method they have used before. When the students have seen the videos in advance, it means that they are better and much faster prepared for the work-based training activities during the sessions in the workshop.



## THE ROAD AHEAD

Meldal VET school experienced during this project that their school should produce safety training related videos of all the machines they apply and use in the workshop. At the end of the project the 17 videos has got very good evaluation feedback from the students, for instance:

- **Starting up the machine:** The video was very useful and clearly demonstrated the steps to safely start the machine. The instructions were clear, making it easy to follow along.
- **Measurements of tools:** The video was informative and showed how to measure the tools correctly, which is essential in obtaining accurate results. The explanations were accurate and precise.
- **Clamping the workplace:** A very good video demonstrating how to secure the workpiece safely such that it dont move during the milling. It was easy to understand and follow.
- **Setting the 0-point on the workpiece:** This is a clear and concise video, demonstrating how to adjust the zero point, which is crucial for accurate milling. It was easy to follow the instructions.
- **Finding the saved program and commissioning:** The video demonstrates how to find a stored program and then start the milling machine, which was very useful. The step-by-step guide helped me to understand the entire process.
- **Turning of the machine:** A short and straightforward video demonstrating how to safely turn of the machine and end the milling work.





# APPLICATION OF EUROPEAN STANDARDS

European standards in Vocational Education and Training (VET) are designed to ensure high-quality, relevant, and accessible education that meets the needs of learners, employers, and society. These standards are guided by policies and frameworks established by the European Union (EU) to promote consistency, excellence, and mobility across member states. This provides a framework to assess, improve, and ensure the quality of VET programs across Europe.

Meldal VET school will further develop videos for application of flipped learning for all the machines they have access to, and align those with the European standards related to work-based learning practices, which is a central feature of European VET programs, integrating practical experience in real-world settings with theoretical education. They have already made 11 new videos, with QR codes, showing the entire sequence of making a copper/nylon hammer from start to finished product. These will help supporting the apprenticeships training, internships exchanges, and further development of partnerships between the VET educational institution and the industry that employ their students.

## iQVet Results

## OUR MAJOR BENEFITS

Meldal VET school is a specialized public school in a rural area in Norway that applies modern and relevant training methods, in cooperation with work-based training practices in the regional industry. Their mechanical industry studies have significantly increased their popularity. During the period 2022-24, they doubled the number of students that started on their industry relevant training programs. The results from this project has made it possible for them to successfully handle this increase, without buying new machines or engaging any new teachers. Smart use of modern learning technologies in combination with experienced teachers and dedicated methods, has made up a success. The students report that the training on the CNC milling machines gave them good insight and a lot of prior knowledge, simply by using their own mobiles in what they consider to be an attractive way. This resulted in a successful learning process and an attractive modernization of VET.

Once these processes have been completed, the teaching will be completely different from what it is today. Students who are a little unsure of how to carry out an exact operation may just use their mobile to scan the QR code that hangs on the machine or is included in the work drawing.



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