Meldal VET School
WP1- Plan for implementation

Flipped learning is an increasingly popular pedagogy. The students in a flipped classroom view structured, targeted, digitized or online video lectures as pre-class homework.

At the VET school they spend in-class time engaged in active learning experiences. This includes for instance discussions, presentations, computations, projects, problem solving, peer teaching, and various types of group activities.

Thus, this strategy "flips" the typical presentation of content where the class time is used for lectures, demonstrations, quizzes, examples and problems, to be followed by homework consisting of problem sets, self studies problems, group project work and assignments.

Flipped Work-Based Learning (WBL) is a particularly good fit for skills-based courses, because class time can be spent practicing and mastering these skills.

However, adopting to a new pedagogy can be daunting. A significant barrier for converting a VET course to a flipped format is the substantial time commitment involved in creating digitized video lectures. The new online tools *Teams* and *Zoom*, give teachers and instructors the possibility to record video clips or create «short» supplementary digital learning materials, in innovative, time- and cost efficient ways.

For VET instructors who have not previously created such digital learning materials, this is a good opportunity and a great time to experiment with flipped learning pedagogics in VET classes.

Intro to Flipped WBL

D1.1 Developing a plan for a blended learning training program that is going to improve the use of CNC milling

Meldal VET school did in the fall 2021 receive a modern CNC machine. It is partly co-funded by cooperating industrial companies in their region. In order to increase the access to and capacity of the work-based training at the machine, the VET school plans to apply a flipped classroom training approach that includes the following:

- **Before class:** The teachers will plan, develop and record short videoclips and sequences of each operation that should be learned at the CNC machine. It will be one QR code on each film / operation. Students should look through them before they arrive to the school.

- **During work-based training:** Physical review at the CNC machine. What is: spindle, work table, control panel, cutting tools. Starting up the machine, defining the measuring tools and selecting the zero point in X-Y-Z at the workpiece. Run a ready-made ICT program.

- **Afterwards in the classroom:** Training at the programming station in the classroom.

D1.2 Hands on demonstrations for the other VET teachers

The Meldal VET school will develop a blended learning framework that is going to support students work based learning through two key activities:

- Invite a colleague (VET teacher) to take part in the initial pilot-testing. Discuss and evaluate together with this teacher if this training program could work out in the class and in particular during the work-based training in the workshop.

- Receive feedback from the colleague (VET teacher) during and after the review process.

Use this feedback and evaluation results to modify and elaborate the proposed blended learning methodology in D1.1.

Implementing Flipped WBL

D1.3 Piloting at VET Supply level

Testing the methodology and tools at the VET school level.

- Review of the videos for all students in the classroom.

- Each class is divided into groups of 2-3 students. Each group receives work-based training in the workshop, including physically training addressing how to operate the CNC machine.

- Each student should run their own ICT program, which is developed using the programming station in the classroom.

D1.4 Develop the first set of baseline guidelines

Develop and illustrate how this new WBL training methodology works out in VET. It will apply cheap and available video equipment and tools, and apply an innovative learning and training methodology.

Such active learning enables VET students to create their own knowledge by building upon pre-existing cognitive frameworks, resulting in a deeper level of learning than occurs in more passive learning settings. In addition, flipped WBL allows students to incorporate foundational information into their long-term memory prior to the class- and workshop based learning and training activities. Flipped WBL lets VET students form new and deeper connections and develop more complex ideas.

It is foreseen that this will include:

- Starting up the programming station in the classroom. How to develop an ICT program that will be understood by the CNC machine?
- Create the ICT program.
- Review of the online videoclips.
- Divide the class into small groups consisting of 2-3 students in each group.
- Work-based training targeting the physical review and start-up of the CNC machine.
- Defining the measuring tools.
- Learn how to define and select the 0-point in X-Y-Z axes, before running the ICT program.
- Run the completed ICT program at the CNC machine.

WP 1 - Detailing and refinement

D1.1 Detailing the blended learning training program that is going to improve the use of CNC milling.

How to train students in using the CNC milling machines in a better way? Prepare monitoring progress in attitudes, knowledge and skills during the national pilot.

Precision mechanical manufacturing by experienced specialists

1. Film short sequences on each operation to be learned. It will be a QR code on each film / operation.
   - Video 1: Starting up the machine
   - Video 2: Measurement of tools
   - Video 3: Clamping the workpiece
   - Video 4: Set 0-point on workpiece
   - Video 5: Find the saved program and commissioning
   - Video 6: Turning of the machine

Optimize new products for mass production

2. Physical review on the machine.
   Explain what is the: spindle, work table, control panel, cutting tools
3. Starting up the machine.
   Measuring tools, setting the zero point in X-Y-Z on the workpiece.
4. Run a ready-made program
5. Training at the programming station in the classroom

Apply new technologies and new standards in mass production.

Refining the best practice guidelines

D1.2 Detailing the hands demonstrations for the other VET teachers

How to show this to other teachers? Compare with D1.2 and testing on students / teachers

Bring a colleague first to test whether this arrangement works in the classroom and workshop.

Feedback from a colleague during and after the review of the method and tools.

D1.3 Detailing the piloting at VET Supply

Test out at school level, students / teachers with evaluation

Review of the videos for all their own students in the classroom.

Use your own class, divided into groups of 2-3 students per work-based learning activity in the workshop

The students receive group instruction physically on the CNC machine

Each student is allowed to run their own custom program from the programming station in the classroom

D1.4 Detailing the first set of baseline guidelines

Set up how this is supposed to work out, if possible as points in a sandwich list.

- Starting the programming station in the classroom. Learn how to make a program.
- Create a program

- Review of the films

- Divide the class into small groups of 2-3 students.

- Physical review of the start-up of the machine

- Measuring the tools

- Learn to put 0-point in the X-Y-Z axes before running the program

- Run the completed software program